THE

AMERICAN GAS-LIGHT JOURNAL.

THE OFFICIAL GAZETTE OF

LIGHT, HEAT, WATER-SUPPLY, AND SEWERAGE.

Rooms—No. 39 Nassau Street, cor. Liberty Street, opposite the Post-Office, New York.

VOL. V.—No. 108. NEW YORK, WEDNESDAY, JUNE 1, 1864. $3 PER ANNUM.

PETROLEM *vs.* GAS.

On page 298 of this volume of the JOURNAL, we printed an abstract of a paper read by Dr. Marcet, before the Society of Arts of London, relating to the supply of petroleum, and its advantages as a source of artificial light. The following additional details are given especting the superiority of petroleum over gas. We think the deductions of the doctor ought to be taken with some grains of allowance, as he does not enter deeply enough into particulars:

"Let us now proceed to compare the light given by a petroleum-lamp, with a wick six-eighths of an inch broad, and that given by tallow candles, composites, sperm candles, and oil. The results have been arranged in the form of the following table, on which I shall make a few remarks:

	Petroleum	Gas.	Tallow Candles.	Comp'sites	Sperm Candles.	Colza Oil.	Sperm Oil.
Light emitted by petroleum lamp equal to....	1.	1 to 13	10.	6.3.	6.5	0.61	0.55
Weight burned in 3 hours 18 minutes.....	1386 grs.	12.7 cub. ft.	408 grs.	550 grs.	480 grs.	2901 grs.	3250 grs.
Price of material burned in 3 hours 18 minutes..	1d.	½d.	4d.	1d.	1¼d.	2¼d.	5d.

"From six experiments, where the amount of petroleum burned varied from 393 grains to 466 grains per hour, the average quantity of the oil consumed was 420 grains, the price of which, at 8s. 8d. a gallon, would be three-tenths of a penny, and, consequently, an amount of petroleum worth only 1d. will burn for three hours and eighteen minutes. Now, two tallow candles, burning for three hours and eighteen minutes will cost about 1d.; and as, according to my experiments, petroleum gives about ten times as much light as a tallow candle, it will follow that the expense of burning petroleum will be the same as that of burning two tallow candles, and there will be no less than five times as much light obtained from the oil as from the two candles.

ANTI-EXPLOSIVE GAS CHANDELIERS.

It is well known that certain descriptions of sliding gas chandeliers are liable to become deranged from several causes, and that inventive men have turned their attention to the subject with more or less success. A serious accident from the breaking of one of the chains of a chandelier having just happened at Wednesbury, public attention has been prominently directed to a combination of inventions forming one patent, which have been produced at the works in Birmingham. The patent of which we speak is that of Messrs. Bark, Allwood and Robinson, three gentlemen who, with considerable inventive skill, have united the advantage of large mechanical knowledge, they being each, as we believe, heads of departments at the Soho Works. The principal causes of explosion have been evaporation of water in the tube, and breaking of the chains to which the weights are suspended, thus allowing the body of the chandelier to fall, and the gas to have free egress. To meet the first of these contingencies, the evaporation of water, the inventors have adopted a very simple plan. Inside the inner tube, connecting the body of the chandelier with the supply-pipe in the ceiling, is fixed a small float, connected with a valve at the head of the tube. Water being poured into the tube in the usual way, it raises the float, and so allows the gas to enter from the supply-pipe; and so long as the water remains at that level, the flow of gas will be steady and uninterrupted; but so soon as, by evaporation, it is reduced below this level, the float falls, the valve closes, and the supply of gas is cut off at the ceiling. In the next invention the same result is obtained, but by different means. Instead of the float and water, there is an inner rod passing up the tube, terminating at the bottom with a knob, which, when turned, shuts off the gas, and prevents all possibility of an accident, even if the chandelier should fall bodily from its place. This would seem to be a great advantage, as by its means the supply of gas to any one chandelier can be as effectually stopped as though it were turned off at the meter, a means which it is not always possible to take. The third invention (which may be used in conjunction with either of the last-mentioned) is an appliance for preventing the chandelier from falling to the ground in the event of either of the weights breaking. This is done in two ways: the one being by putting round the smaller inner supply-pipe, at about a foot and a half (or any other length that may be thought desirable) from the ceiling, a flange of metal, projecting some little distance from the tube, upon which a similar flange at the head of the loose tube rests, in the event of the support of the weights being taken away. The other plan is by placing round the outside of the outer tube a number of rods with "nuts" at the bottom, upon which rods run sockets connected with the main tubes. If either or both of the weights become dissevered from the chandelier, it would fall as far as the "nuts," which would prevent all further progress. In addition to being useful, this latter plan may be made very ornamental, as it takes away the unsightly appearance of the one single thin pipe, which is exposed when the chandelier is drawn down. Such is a brief sketch of the main points of an invention which has attracted to Mr. Cocking's patent office in Ann street, Birmingham, a large number of the principal chandelier manufacturers of that town, all of whom have spoken approvingly of the scheme, which recommends itself both by its simplicity and by its apparently complete adaptability to the object contemplated—namely, the prevention of gas explosions in houses.—*Ironmonger.*

DEATH BY INHALING COAL GAS.

The Patterson (N. J.) *Guardian* says: "Some few years ago, Judge Crane, of Morris, New Jersey, visited Patterson, and stopping at the house of J. P. Huntoon, retired to bed as usual. In the morning early, Mr. Huntoon was alarmed by a great noise, as if a drunken man was tumbling about. Jumping up he found the Judge in the hall, sadly convulsed, trying to come to, and struggling and tumbling about. The strong smell of street gas in the house divulged the secret of the condition of the old gentleman, who had, on retiring to bed, left the gas jet leaking, and when awakening in the morning, he had just reason and strength enough left to tumble out into the hall, where, when found by Mr. Huntoon, he was more than half dead. During the morning, however, he recovered and left, one would have supposed, sufficiently warned of the danger of carelessness in the future, in reference to this matter. Two weeks ago, Judge Crane started for the West. Yesterday, intelligence arrived to the effect that he was dead—had been killed by an accident precisely like that which so nearly terminated his career years ago, at Mr. Huntoon's. It appears from the letters received, that he went to his room and locked the door, as is usual at the hotel. In the morning, a strong smell of gas was discovered coming from his lodging-place, and upon breaking open the door, he was discovered to be dead—strangled by the gas as he lay."

NEW GAS COAL COMPANY.

The town of Fairmont is situated upon the south-western bank of the Monongahela river, at its junction with Coal river. The population are largely engaged in mining, as well as agricultural pursuits, and it is in this vicinity that the richest gas-producing coals are to be found. A gentleman, by the name of Watson, has been working a mine of fourteen acres, just outside the town, for the last ten years, and has derived therefrom a yield of twelve thousand tons per acre, at an average net profit of two dollars per ton. He has furnished the city of Cumberland with all their gas coal during the period named, there being no coal of the same quality to be found anywhere west of the mountains, and, as it is well known, there is no gas coal at all east of the Alleghenies. He has also supplied Washington city, Wheeling, the Manhattan Works, New York, and other gas companies, with all the coal he could possibly spare them, but not sufficient to meet their wants. Mr. Watson has from time to time purchased land adjacent to his mine, through which the vein or sheet extends until he has now six hundred acres in one mass, which can be opened at any one point, and give forth an abundant yield. Several headings have already been driven, and a depth of vein ascertained from ten to fourteen feet of the purest coal, highly bituminous, and entirely free from rust or other impurity. We learn that the American Gas Coal Company of Baltimore had purchased Mr. Watson's interest in the six hundred acres alluded to, and will at once proceed with an ample capital, and on the largest scale, to develop all the resources of this valuable property.

THE LENOIR GAS ENGINE.—We have been to the Grand Hotel It is not far, and we have examined the *Moteurs Lenoir* laboring for the comfort of the thousand travelers lodged in that caravansera of the great world. There is one which supplies all of the water for the hotel from the cellar to the garret; another raises the dishes from the basement to the fourth story; another turns the machine for breaking the ice and cooling the sillery, the cliquot. Six men were formerly required, half naked and panting, to operate this machine which the little motor turns like a top. Another motor raises to their respective stories the travelers, comfortably seated in a saloon disposed for this perpendicular voyage; another raises the baggage, and all this without noise, without fire, without smoke.

The complaisance of the mechanician charged in the hotel with all the mechanical service, enables us to see how these motors put themselves in operation, and stop themselves instantaneously.

What gives to them the movement—origin of their power? It is gas, which air electric spark inflames in the body of the pieton. That gas—it is that which the immense *Compagnie parisienne* distributes in all the city. It comes to feed the Lenoir motor as it would feed a burner or a stove.—*Le Petit Journal.*

WHAT STATE?—We have received a letter from the "Salem Gas-Light Company," complaining of the non-receipt of several numbers of the JOURNAL. We really do not know where the letter came from, and are at a loss how to answer it. There are gas companies in Salem, Mass., Salem, N. J., and Salem, Ohio, and which of these companies is the one in question we know not. Correspondents would save themselves and us much trouble by distinctly and plainly giving the name of the post office *and State* in every instance. The above illustration is but one case in a thousand where similar inaccuracies have been committed.

GAS-LIGHT COMPANIES IN THE UNITED STATES.

Compiled from official sources expressly for the AMERICAN GAS-LIGHT JOURNAL.

CORRECTED BY JOHN B. MURRAY & CO., No. 11 BROAD STREET, NEW YORK, SHARE BROKERS.

When Chartered.	Town.	State.	Chartered Capital.	Par Val. Per Sh. $	Semi-Ann'l Div'd.	Dividends Payable.	Population of Gas District.	Price per 1000 Feet.	Asked pr. cent.	Offered pr. cent.	REMARKS
1857	ADRIAN	Mich.	50,000	50	—	May & November.	4,000	3 50	....	....	
1856	AKRON	O.	20 000	33⅓	—	Do.	3,500	3 00	....	....	
1845	ALBANY	N. Y.	250.000	25	4	January & July.	65,000	3 00	120	....	None in market.
1838	ALBION	N. Y.	30,000	100	—	Do.	3,000	3 80	....	....	
1851	ALEXANDRIA	Va.	106,880	—	—	City Works.	9,000	3 50	....	....	
1852	ALLEGHANY	Pa.	200,000	25	4	May & November.	25,000	3 00	....	....	
1858	ALLENTOWN	Pa.	60,000	100	3½	Do.	5,000	3 50	....	....	
1857	ALTON	Ill.	75,000	—	—	Private Works.	4,000	3 50	....	....	
1850	ALTOONA	Pa.	40,000	20	4	January & July.	5,000	3 00	....	....	
1850	AMESBURY AND SALISBURY	Mass.	80,000	25	—	Do.	7,000	4 00	....	....	
1858	ANNAPOLIS	Md.	100,000	25	—	Do.	4,000	4 00	....	....	
1856	ANN ARBOR	Mich.	28,000	50	5	March & September.	5,500	4 00	....	....	
1838	ASTORIA	N. Y.	20,000	50	—	Do.	6,000	4 00	....	....	
1855	ATLANTA	Ga.	50,000	25	5	January & July.	12,000	5 00	....	....	
1857	ATTLEBORO'	Mass.	6,000	50	3	Do.	2,000	6 00	....	....	
1850	AUBURN	N. Y.	80,000	50	5	Do.	10,000	7 00	....	....	
1851	AUGUSTA	Ga.	80,000	25	8	Do.	9,000	6 00	....	....	
1858	AUGUSTA AND HALLOWELL	Me.	84,700	50	5	Do.	10,000	4 00	....	....	
1860	AURORA	Ind.	10,000	—	—	Private Works.	3,500	3 50	....	....	Formerly used Sanders' Water-Gas. Recently altered to Coal Gas-Works.
1817	BALTIMORE	Md.	550,000	100	5	June & December.	150.000	2 50	150	....	None for sale.
1852	BANGOR	Me.	120,000	100	2½	January & July.	12,000	3 00	100	....	
1855	BATAVIA	N. Y.	32,000	20	4	Do.	2,500	4 00	100	100	Stock firm. Good works and well managed.
1848	BATH	Me.	65,000	100	3	April & October.	10,000	3 75	....	....	
1859	BATH	N. Y.	15,000	50	—	May & November.	3,000	7 00	....	....	
1861	BATTLE CREEK	Mich.	15,000	—	—	January & July.			....	....	
1838	BELFAST	Me.	14,000	100	—	Do.	7,000	7 00	....	....	
1856	BELLEFONT	Pa.	20,000	25	2	Do.	3,500	4 00	....	....	
	BELOIT	Wis.	30,000	—	—	Do.	4,000	4 00	....	....	
1854	BETHLEHEM	Pa.	50,000	50	4	June & December.	2,000	3 20	....	....	
1850	BEVERLY	Mass.	40,000	100	—	January & July.	4,000	4 00	....	....	
1853	BINGHAMTON	N. Y.	50,000	50	3½	Do.	10 000	4 00	....	....	
1859	BIRMINGHAM	Pa.	20,000	50	—	Do.	4,000	4 00	....	....	
1855	BLOOMINGTON	Ill.	40,000	50	—	Do.	6,000	4 00	....	....	
1856	BORDENTOWN	N. J.	50,000	25	3	June & December.	4,000	3 80	....	....	
1822	BOSTON	Mass.	1,000,000	500	5	Do.	130,000	2 50	....	....	
1850	BRATTLEBORO'	Vt.	21 000	—	—	Do.	3,000	4 00	....	....	
1851	BRIDGEPORT	Ct.	90,000	25	4	January & July.	10,000	4 00	90	....	Passed last dividend.
1847	BRIDGETON	N. J.	50,000	20	—	Do.	5,000	4 00	....	....	
1856	BRISTOL	Pa.	30,000	25	3	February & August.	3,000	4 00	....	....	
1855	BRISTOL	R. I.	35,000	50	2	January & July.	6,000	4 00	....	....	
1850	BROCKPORT	N. Y.	25,000	100	3	Do.	1,500	4 00	....	....	
1853	BROOKLINE	Mass.	77,000	100	4	February & August.	3,500	3 50	....	....	
1825	BROOKLYN	N. Y.	2,000,000	25	5	January & July.	75,000	2 50	170	160	
	BROWNSVILLE	Pa.				Do.			....	....	
1848	BUFFALO	N. Y.	600,000	50	5	Do.	70,000	2 90	140	125	
1852	BURLINGTON	N. J.	100,000	25	3½	Do.	5,000	4 00	105	....	
1853	BURLINGTON	Vt.	75,000	25	2½	Do.	10,000	4 50	....	....	
1859	BURLINGTON	Iowa.	65,000	50	—	Do.	8,000	4 00	....	....	
1851	CALAIS	Me.	90,000	100	—	Do.	10,000	3 50	....	....	
1852	CAMBRIDGE	Mass.	300,000	100	5	February & August.	20,000	3 50	100	97½	
1852	CAMDEN	N. J.	300,000	100	3	April & October.	15,000	3 85	105	100	
1856	CANANDAIGUA	N. Y.	50,000	50	—	January & July.	3,000	4 00	90	80	
1856	CANTON	O.	19,000	50	6	March & September.	6,000	3 00	....	....	
1853	CAPE ISLAND	N. J.	80,000	100	—	October.	10,000	6 00	....	....	Watering place.—These Works only run in summer.
1860	CARBONDALE	Pa.	16,000	25	—	March & September.	5,000	4 00	....	....	
1855	CARLISLE	Pa.	80,000	25	—	January & July.	4,000	4 00	....	....	
1856	CATASAUQUA	Pa.	15,000	25	5	May & November.	2,000	4 00	....	....	
1858	CATSKILL	N. Y.		—	—	Private Works.	3,000	3 00	....	....	Owned by G. T. Sutton.
1857	CHAMBERSBURG	Pa.	80,000	25	—	January & July.	3,000	4 00	....	....	
1846	CHARLESTON	S. C.	725,800	25	4	Do.	50,000	4 00	....	....	
1851	CHARLESTOWN	Mass.	200,000	50	4	Do.	30,000	3 00	....	....	
1858	CHARLOTTE	N. C.	14,000	50	10	March & September.	3,500	6 00	....	....	
1850	CHARLOTTEVILLE	Vt.	15,000	25	—	Do.	4,000	4 50	....	....	
1851	CHELSEA	Mass.	100,000	100	3½	January & July.	8,000	3 50	....	....	
1856	CHESTER	Pa.	35,000	25	3	April & October.	4,000	4 00	....	....	
1849	CHICAGO	Ill.	1,200,000	25	5	January & July.	100,000	2 50	150	140	Very scarce. Stock wanted.
1857	CHICOPEE	Mass.	50,000	20	—	Do.		4 00	....	....	
1851	CHILLICOTHE	O.	40,000	25	4	Do.	12,000	3 50	....	....	
1841	CINCINNATI	O.	1,600,000	100	5	Do.	225,000	2 50	....	....	
1850	CITIZENS', BROOKLYN	N. Y.	1,000,000	20	—	Do.	155,000	3 00	128	125	
1860	CITIZENS', READING	Mass.	90,000	100	—				....	....	
	CLARKESVILLE	Tenn.	100,000	50	—	Do.	5,000	4 00	....	....	
1860	CLAREMONT	N. H.	20,000	100	—	March & September.	3,000	4 00	....	....	
1846	CLEVELAND	O.	200,000	10	5	January & July.	20,000	3 00	....	....	
1858	CLINTON	Mass.	30,000	500	5	Do.	3,000	4 00	....	....	
1859	CLYDE	N. Y.	10,000	50	4	Do.	2,500	4 00	....	....	
1854	COHOES	N. Y.	50,000	20	3½	April & October.	5,000	3 60	....	....	
1860	COLD SPRING	N. Y.	30,000	50	—	Do.	8,500	4 00	95	....	Formerly Rosin-Gas, but now Coal. A well managed company. Stock firmly held.
1860	COLD WATER	Mich.	25,000	50	5	January & July.	4,000	4 00	....	....	
1852	COLUMBIA	Pa.	37,500	25	—	Do.	4,000	3 50	....	....	
1852	COLUMBIA	S. C.	44,000	25	4	Do.	6,000	6 00	....	....	
1857	COLUMBIA	Cal.	50,000	25	—	Do.	4,500	10 00	....	....	
1856	COLUMBUS	Ga.	54,000	25	5	Do.	5,000	7 00	....	....	
1850	COLUMBUS	O.	180,000	10	6	Do.	30,000	3 00	....	....	
1858	CONCORD	N. H.	50,000	50	5	Do.	8,000	3 50	....	....	
1858	COVINGTON AND NEWPORT	Ky.	100,000	50	3½	Do.	28,000	4 00	...	....	
1854	CUMBERLAND	Md.	60,000	50	3	Do.	6,000	4 00	....	....	
1857	DANBURY	Ct.	50,000	25	4	Do.	2,000	3 75	....	...	
1856	DANVILLE	Pa.	30,000	25	—	June & December.	3 000	4 00	....	....	
1855	DAVENPORT	Iowa.	56,000	100	—	Do.	6,000	5 00	....	....	
1848	DAYTON	O.	50,000	25	5	February & August.	8,000	3 50	....	....	
1858	DEDHAM	Mass.	40 000	50	—	January & July.	3,000	4 00	....	....	
1860	DELAWARE	O.	30,000	25	—	Do.	2,500	3 00	....	....	
1849	DETROIT	Mich.	500,000	50	5	Do.	30,000	3 50	160	150	Excellen tock. No sales.
1860	DOBBS' FERRY	N. Y.	25,000	—	—	Do.	3,000	4 00	....	....	
1854	DORCHESTER	Mass.	150,000	100	—	Do.	14,000	4 00	....	....	
1850	DOVER	Del.	12,000	—	—	Private Works.	2,000	4 00	....	....	
	DOVER	N. H.				January & July.			....	....	
1857	DOYLESTOWN	Pa.	50,000	—	—	Do.	3,000	4 00	....	....	
1854	DUBUQUE	Iowa.	50,000	115	3½	Do.	17,000	4 50	....	115	This stock is wanted at par.
1838	EAST BOSTON	Mass.	133,000	25	4	Do.	20,000	3 50	....	145	No transactions.
1856	EAST GREENWICH	R. I.	11,200	100	15	Do.	3,000	7 00	....	....	
1861	EAST HAMPTON	Mass.	10,000	25	—	Do.	5,000	9 00	....	....	
1841	EAST NEW YORK	N. Y.	50,000	50	—	Do.	12,000	3 50	....	....	
1857	EASTON	Md.	9,000	10	—	Do.	1,500	7 00	....	....	
1850	EASTON	Pa.	125,000	50	4	June & December.	6,000	3 60	....	....	
1856	EASTPORT	Me.	50,000	55	—	Do.	3,000	4 00	....	....	
1855	ELIZABETH	N. J.	100,000	20	4	January & July.	14,000	3 50	....	....	
	ELLICOTT'S MILLS	Md.	10,000	—	—	Do.	4,000	4 00	....	....	
1859	ELMIRA	N. Y.	50,000	25	3½	Do.	5,000	4 00	....	....	
1852	ERIE	Pa.	68,000	50	3½	June & December.	10 000	3 00	....	....	
1853	EVANSVILLE	Ind.	60,000	50	4	January & July.	12,000	4 00	110	....	A very good Company.
	EXETER	N. H.	60,000	—	—	Do.	12,000		....	....	
	FAIR HAVEN	Ct.	20,000	25		Do.	8,000	4 00	....	....	
1847	FALL RIVER	Mass.	26,000	—	—	Private Works.	12,000	3 50	....	....	
1859	FAYETTEVILLE	N. C.	25,000	100	6	January & July.	7,000	6 00	....	....	
	FIFTH WARD (Milwaukee)	Wis.	50,000	25	—	Do.	10,000	4 00	....	....	
1857	FISHKILL	N. Y.	10,000	20	—	April & October.	1,500	9 00	....	....	Make Petroleum-Gas.
1853	FITCHBURG	Mass.	100,000	50	3	January & July.	5,000	4 00	....	....	
1859	FLEMINGTON	N. J.	20,000	—	—	Do.	3,000	4 00	....	....	
1835	FLUSHING	N. Y.	20,000	50	1½	March & September.	6,500	4 00	...	....	
1858	FOLSOM	Cal.								....	
	FORT WAYNE	Ind.	40,000	25	—	Do.	6,000	4 00	....	....	
1851	FRANKFORT	Ky.	50,000	—	—	City Works.	5,500	4 50	...	....	
1851	FREDERICK CITY	Md.	86,000	100	—	January & July.	5,000	6 70	....	....	
1854	FREDERICKSBURG	Va.	72,500	50	5	Do.	4,500	4 00	....	....	
1858	FREDONIA (Natural Gas)	N. Y.	10,000	100	—	Do.	2,000	4 00	....	....	Unlimited supply of Natural Gas.
1856	FREEPORT	Ill.	20,000	100	—	May & November.	10,000	4 00	....	....	

GAS-LIGHT COMPANIES IN THE UNITED STATES.—Continued.

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When Chartered.	Town.	State.	Chartered Capital.	Par Val. Per Sh. $	Semi-Ann'l Div'd.	Dividends Payable.	Population of Gas District.	Price per 1000 Feet.	Asked pr. cent.	Offered pr. cent.	REMARKS.
1859	Fremont	O.	25,000	25	—	May & November.	2,000	4 50	....	....	
1838	Fulton	N. Y.	12,000	100	—	Do.	4,000	7 00	....	....	
1855	Galena	Ill.	70,000	100	—	Do.	8,000	4 00	....	....	
1859	Galion	O.	25,000	25	—	January & July.	1,800	3 00	....	....	
1858	Galveston	Texas.	150,000	50	—	May & November.	7,000	6 00	....	....	
1854	Gardiner	Me.	100,000	50	4	Do.	8,000	4 00	....	....	
1853	Geneva	N. Y.	75,000	25	2½	Do.	6,000	4 00	....	....	
1851	Germantown	Pa.	Merged	into	the	Philadelphia Works.	12,000	2 25	....	....	
1859	Gettysburg	Pa.	20,000	50	3	January & July.	2,500	4 00	....	....	
1854	Glenn's Falls	N. Y.	35,000	50	3	February & August.	4,000	4 00	....	....	
1854	Gloucester	Mass.	40,000	50	—	January & July.	5,000	3 50	....	....	
1857	Gloversville	N. Y.	15,000	25	—	Do.	3,000	3 50	....	....	
1858	Grand Rapids	Mich.	50,000	20	—	Do.	3,000	4 00	....	....	
1855	Great Barrington	Mass.	5,000	100	5	April & October.	2,000	7 00	....	....	
1849	Great Falls	N. H.	50,000	100	3	Do.	3,000	4 00	....	....	
1860	Greenfield	Mass.	20,000	50	2	January & July.	2,500	4 00	....	....	Close corporation.
1858	Greenpoint	N. Y.	100,000	50	5	Do.	20,000	3 00	....	....	
1859	Greensboro'	N. C.	12,000	50	—	April & October.	3,000	7 00	....	....	
1858	Greensburg	Pa.	30,000	25	3	May & November.	2,000	3 00	....	....	
1854	Hagerstown	Md.	15,000	20	—	January & July.	2,000	6 00	....	....	
	Hamilton	O.	15,000			Do.			....	....	
1859	Hannibal	Mo.	100,000	100	—	Do.	6,000	3 50	....	....	
1857	Harlem	N. Y.	350,000	50	3½	Do.	25,000	3 00	....	145	
1855	Harrisburg	Pa.	100,000	—	4	Do.	5,000	4 00	....	....	
1849	Hartford	Ct.	200,000	25	4	Do.	25,000	3 00	150	140	Stock in demand.
	Hastings	N. Y.				Do.	8,000	4 00	....	....	
1853	Haverhill	Mass.	50,000	50	—	Do.	5,000	4 00	....	....	
1859	Haverstraw	N. Y.	20,000	100	—	Do.	5,000	4 00	....	....	
1861	Hayesville	Mass.	15,000	25		Do.	4,000	4 00	....	....	
1859	Hempstead	N. Y.	16,000	25	—	Do.	1,000	4 00	....	....	
1862	Hoboken	N. J.	100,000	25	3	Do.	30,000	2 50	....	100	Works not yet built.
1856	Hollidaysburg	Pa.	80,000	25	2	Do.	4,000	3 50	....	....	
1861	Holyoke	Mass.	20,000	25	—	Do.	3,000	4 00	....	....	
1861	Homer & Cortlandt	N. Y.	40,000	100	—	Do.	6,000	4 00	....	....	
1854	Honesdale	Pa.	80,000	25	3	Do.	2,500	4 00	....	....	
1860	Hornellsville	N. Y.	12,000	50	—	Do.	2,000	4 00	....	....	
1853	Hudson	N. Y.	50,000	100	3½	February & August.	3,000	4 00	....	....	
	Hunter's Point	N. Y.									
1857	Huntington	Pa.	18,000	50	3	Do.	2,000	3 50	....	....	
1856	Huntsville	Ala.	7,325	25	—	June & December.	2,000	5 00	....	....	
	Indianapolis	Ind.	150,000	—	—	Do.	15,000	5 00	....	....	
1857	Iowa City	Iowa.	40,000	50	—	February & August.	4,000	4 50	....	....	
1852	Ithaca	N. Y.	75,000	25	3½	January & July.	6,000	4 00	....	....	
1857	Jackson	Mich.	25,000	50	5	Do.	6,000	3 50	....	....	
	Jackson	Miss.	80,000	50	—	Do.	4,000	4 50	....	....	
	Jackson	Cal.	50,000	30	—	Do.	4,000	10 00	....	....	
	Jacksonville	Flor.	30,000	20	—	Do.	2,000	7 00	....	....	
	Jacksonville	Ind.	50,000	50	—	Do.	4,000	5 00	....	....	
1858	Jacksonville	Mo.	25,000	25	—	Do.	7,000	6 00	....	....	
1856	Jamaica	N. Y.	20,000	—	4	Do.	6,000	4 00	....	....	
1853	Jamaica Plain	Mass.	75,000	100	3	Do.	3,000	3 00	....	....	
	Jamestown	N. Y.	25,000	—	—	Do.	4,000	4 00	....	....	
1856	Janesville	Wis.	50,000	100	—	Do.	12,000	4 00	....	....	
	Jeffersonville	Md.	30,000	25		Do.	4,000	4 00	....	....	
1853	Jersey City	N. J.	300,000	—	5	Do.	30,000	3 00	150	....	No sales since formation of Hoboken Co.
1858	Jersey Shore	Pa.	15,000	25	—	Do.	2,000	3 70	....	....	
1856	Johnstown	Pa.	80,000	25	3	Do.	8,000	3 00	....	....	
1857	Joliet	Ill.	300,000	100	—	June & December.	6,000	4 00	....	....	
1858	Kalamazoo	Mich.	30,000	50	5	Do.	10,000	4 00	....	....	
1860	Keene	N. H.	60,000	100	—	Do.	4,500	4 00	....	....	
1855	Keokuk	Iowa.	100,000	100	—	January & July.	10,000	4 50	....	....	
1855	Kingston	Pa.	50,000	50	—	Do.	3,000	4 00	....	....	
1859	Kittanning	Pa.	20,000	—	—	Doubtful.	5,000	4 00	....	....	Said to be a fraud.
1854	Knoxville	Tenn.	68,000	—	—	April & October.	4,000	5 00	....	....	
1860	Laconia	N. H.	20,000	100	—	Do.	4,000	6 00	....	....	
1859	La Crosse City	Wis.	100,000	50	—	June & December.	10,000	8 00	....	....	Petroleum and Wood Gas.
1854	Lafayette	Ind.	60,000	50	4	January & July.	10,000	3 25	....	....	
1856	Lambertville	N. J.	30,000	25	—	Do.	2,600	4 00	....	....	
1849	Lancaster	Pa.	100,000	50	4	Do.	10,000	3 00	....	....	
1856	Lancaster	O.	25,000	100	5	Do.	5,000	3 50	....	....	
1855	Lansingburg	N. Y.	25,000	100	—	Private Works.	7,000	4 00	....	....	
1849	Lawrence	Mass.	200,000	100	4	February & August.	15,000	3 50	....	....	
1859	Leavenworth	Kansas.	200,000	25	—	Private Works.	15,000	4 00	....	....	
1856	Lebanon	Pa.	26,000	50	—	February & August.	5,000	4 00	....	....	
1861	Le Roy	N. Y.	25,000	50	—	Do.	4,000	4 00	....	....	
1858	Lewisburg	Pa.	20,000	100	—	January & July.	4,000	4 00	....	....	
1852	Lewiston	Me.	100,000	100	3	Do.	10,000	3 20	....	....	
1856	Lewistown	Pa.	30,000	50	3	April & October.	3,000	3 10	....	....	
1858	Lexington	Ky.	100,000	25	4	January & July.	5,000	4 00	....	....	
1858	Little Falls	N. Y.	112,000	25	—	Do.	3,500	7 00	....	....	
1861	Little Rock	Ark.	20,000	—	—	Do.	5,000	6 00	....	....	
1853	Lockhaven	Pa.	28,000	—	—	Do.	3,000	4 00	....	....	
	Lockport	N. Y.	100,000	50	—	Do.	4,000	4 00	....	....	
	Logansport	Ind.	40,000		5	April & October.	5,000	4 00	105		But $481,400 stock has been sold. This Company has a large contingent fund and undivided profit on hand.
1838	Louisville	Ky.	600,000	50	6	January & July.	80,000	2 50	125	....	
1849	Lowell	Mass.	200,000	25	5	Do.	50,000	3 25	....	....	
1852	Lynchburg	Va.	70,000	25	5	Do.	6,000	3 80	....	....	
1852	Lynn	Mass.	55,000	50	4	Do.	20,000	4 00	....	....	
1859	Lyons	N. Y.	30,000	100	—	Do.	4,000	4 00	....	....	
1852	Macon	Ga.	75,160	25	6	Do.	5,000	5 00	....	....	
1851	Madison	Ind.	150,000	25	3	Do.	10,100	3 50	....	....	
1855	Madison	Wis.	100,000	25	—	Do.	5,000	5 00	....	....	
1854	Malden & Melrose	Mass.	50,600	25	3	February & August.	5,000	4 00	....	....	
1852	Manayunk	Pa.	40,000	100	—	Do.	7,000	4 00	....	....	
1852	Manchester	N. H.	100,000	100	5	January & July.	25,600	3 00	....	....	
1830	Manhattan (N. Y. City)	N. Y.	4,000,000	50	5	Do.	600,000	2 50	....	....	
	Mansfield	O.	25,000	—	—	Do.	10,000	4 00	....	....	
1854	Marblehead	Mass.	40,000	100	3	Do.	1,000	4 00	....	....	
	Marlboro'	Mass.	20,000	—	—	Do.	8,000	4 00	....	....	
	Mauch Chunk	Pa.	50,000	50	—	Do.	7,000	4 00	....	....	
1857	Marietta	O.	50,000	50	—	Do.	7,000	4 00	....	....	Stock firm.
1860	Marion	O.	12,000	25	5	April & October.	1,500	13 55	....	....	
1858	Marysville	Cal.	50,000	100	—	January & July.	4,000	2 50	....	....	
1857	Massilon	O.	20,000	25	—	Do.	5,000	3 00	....	....	
1855	Meadville	Pa.	89,000	25	3	Do.	4,000	3 50	....	....	
	Medina	N. Y.	2,000	100	—	Do.	2,000	7 00	....	....	
1852	Memphis	Tenn.	300,000	100	5	June & December.	12,000	5 00	....	....	
	Meriden	Ct.	20,000			Do.			....	....	
1850	Metropolitan (N. Y. City)	N. Y.	1,000,000	100	—	January & July.	200,000	2 50	....	....	
1859	Middleboro'	Mass.	15,000	—	—	Private Works.		6 00	....	....	
1858	Middletown	Ct.	50,000	25	3	March & September.	5,000	3 80	....	....	Owned by S. T. Sutton
	Middletown	N. Y.		25	—	Private Works.	5,000	3 00	....	....	
	Milford	Mass.	20,000	—	—	Do.		4 00	....	....	
	Milledgeville	Ga.	100,000	50	—	Do.		5 00	....	....	
	Milton	Pa.	10,000			Do.			....	....	
1847	Milwaukee	Wis.	400,000	50	5	January & July.	24,000	3 50	150	....	
1852	Mobile	Ala.	200,000	—	—	Do.	30,000	4 50	....	....	
1836	Monroe	Mich.	40,000	50	—	Do.	5,000	3 50	50	....	
1852	Montgomery	Ala.	100,000	25	4	February & August.	7,000	6 00	....	....	
1856	Montpelier	Vt.	30,000	25	3	January & July.	5,000	4 50	....	....	
1859	Morrisania	N. Y.	30,000	50	—	Do.		4 00	....	....	
1859	Morristown	N. J.	18,000	50	—	Do.	2,500	4 00	....	....	
1854	Mount Holly	N. J.	16,650	25	3	April & October.	2,000	7 00	....	....	
	Mount Vernon	O.	50,000	100	—	Do.		4 00	....	....	
1857	Muscatine	Iowa.	50,000	100	—	January & July.	3,000	4 50	....	....	
1854	Nantucket	Mass.	50,000	100	3	February & August.	8,000	4 00	....	....	

GAS-LIGHT COMPANIES IN THE UNITED STATES.—Continued.

Compiled from official sources expressly for the AMERICAN GAS-LIGHT JOURNAL.

CORRECTED BY JOHN B. MURRAY & CO., No. 11 BROAD STREET, NEW YORK, SHARE BROKERS.

When Chartered.	Town.	State.	Chartered Capital.	Par Val. per Sh. $	Semi-Ann'l Div.	Dividends Payable.	Population of Gas District.	Price per 1000 Feet.	Asked pr. cent.	Offered pr. cent.	REMARKS.
1852	Nashua	N. H.	45,000	50	2½	January & July.	10,000	3 50	....	....	
1850	Nashville	Tenn.	250,000	50	5	Do.	25,000	3 50	....	....	
1858	Natchez	Miss.	46,000	50	—	Do.	20,000	5 00	....	....	
	Nevada City	Cal.							....	....	
1852	New Albany	Ind.	200,000	50	2½	Do.	16,000	3 50	....	....	
1846	Newark	N. J.	362,000	50	5	Do.	45,000	3 02	180	....	Always a favorite stock.
1856	Newark	O.	30,000	100	—	Do.	7,000	5 40	....	....	
1852	New Bedford	Mass.	180 000	100	5	Do.	15,000	2 90	102	....	Well managed and kept quiet.
1859	Newbern	N. C.	22,000	100	6	Do.	6,000	3 50	....	....	
	New Britain	Ct.	30,000	20	5	Do.	3,000	4 00	....	....	
1851	New Brunswick	N. J.	100,000	20	4	Do.	8,000	3 00	115	....	
1852	Newburg	N. Y.	67,000	20	4	Do.	10,000	4 00	105	....	
1852	Newburyport	Mass.	150,000	10	4	Do.	9,000	4 00	92½	....	
1857	Newcastle	Del.	32,300	10	3	Do.	4,000	4 00	90	....	
1847	New Haven	Ct.	250,000	25	4	Do.	50,000	3 00	155	....	None in market.
1858	New London	Ct.	70,000	50	3	Do.	12,000	4 00	105	....	
1835	New Orleans	La.	1,500,000	100	6	Do.	120,000	4 00	180	....	
1852	Newport	R. I.	130,200	100	4	Do.	10,000	3 50	112	....	
1854	Newton & Watertown	Mass.	92,000	100	2	Do.	10,000	4 00	....	....	
	Newton	N. J.	30,000	—	—	Do.	3,000	4 00	....	....	
	Newton	Pa.	20,000	50	—	Do.	2,500	4 00	....	....	
	Newtown	N. Y.									
1823	New York	N. Y.	1,000,000	50	5	May & November.	100,000	2 50	300	....	
1859	Niagara Falls	N. Y.	15,000	25	—	Do.	3,000	4 00	90	....	
	Norfolk	Va.	60,000	25	—	Do.	40,000	4 00	....	....	
1853	Norristown	Pa.	41,700	25	4	June & December.	8,000	3 50	....	....	
1855	North Attleboro'	Mass.	50,000	100	3½	Do.	6,000	4 00	....	....	
	Northern Liberties	Pa.	400,000	25	7	City Works.	40,000	2 50	....	....	
	North Adams	Mass.	25,000	—	—	March & September.	30,000	4 00	....	....	
1856	Northampton	Mass.	35,000	25	3	January & July.	4,500	4 00	....	....	
1859	North Bridgewater	Mass.	16,000	100	4	June & December.	1,000	7 00	....	....	
1856	Norwalk	Ct.	30,000	150	4	February & August.	6,000	4 00	....	....	
1859	Norwalk	O.	30,000	25	—	January & July.	4,000	4 00	....	....	
1854	Norwich	Ct.	75,000	25	2½	Do.	12,000	3 50	....	....	
1861	Norwich	N. Y.	12,000	50	—	Do.	2,500	4 00	....	....	
1859	Nyack	N. Y.	20,000	100	—	Do.	2,500	4 00	....	....	
1860	Oberlin	O.	10,000	—	—	Do.	1,200	4 00	....	....	
1855	Ogdensburg	N. Y.	75,000	50	5	Do.	9,000	4 00	....	....	
1859	Orange	N. J.	65,000	25	—	Do.	6,000	3 50	....	....	
1852	Oswego	N. Y.	81,250	100	3½	Do.	15,000	4 00	105	....	Good works, built by Hoy, Jr., & Kennedy.
1855	Ottawa	Ill.	45,000	100	6½	Do.	6,000	4 00	....	....	
1856	Owego	N. Y.	40,000	50	3½	Do.	5,000	4 00	....	....	
1860	Owensboro'	Ky.	25,000	25	—	Do.	4,000	3 50	....	....	
1856	Paducah	Ky.	75,000	100	—	May & November.	4,000	5 00	....	....	
1861	Painsville	O.	40,000	25	5	Do.	2,500	5 00	....	....	
1856	Palmyra	N. Y.	12,000	25	—	January & July.	3,000	7 00	....	....	
1847	Paterson	N. J.	125,000	25	3	Do.	20,000	3 50	95	....	
1850	Pawtucket	R. I.	75,000	50	4	Do.	12,000	3 00	....	....	
1855	Peekskill	N..Y.	31,000	50	3	June & December.	4,000	4 00	....	....	Surplus $10,000, May 15, 1863.
1860	Penn Yan	N. Y.	12,000	50	5	Do.	3,000	4 00	....	....	Works leased to Gilbert T. Sutton.
1859	Peoples', Chicago	Ill.	500,000	50	New	Do.	100,000	2 50	....	....	
1853	Peoria	Ill.	160,000	50	4	Do.	8,000	3 50	....	....	What is this Company doing?
1852	Petersburg	Va.	120,000	—	5	January & July.	20,000	3 80	....	....	
1841	Philadelphia	Pa.	3,000,000	50	—	City Works.	650,000	2 50	....	....	
1855	Piqua	O.	50,000	50	—	January & July.	6,500	4 00	....	....	
1835	Pittsburg	Pa.	300,000	100	5	Do.	60,000	1 50	115	....	
1854	Pittsfield	Mass.	50,000	100	5	Do.	4,500	4 00	....	....	
1858	Placerville	Cal.	30,000	50	—	Do.	4,500	10 00	....	....	
1860	Plainfield	N. J.	25,000	50	—	Do.	2,500	4 00	....	....	
1859	Plattsburg	N. Y.	16,000	50	—	January & July.	5,000	7 00	....	....	
1858	Plymouth	Mass.	40,000	100	—	April & October.	8,000	4 00	....	....	
1860	Port Chester	N. Y.	50,000	50	—	Do.	4,000	4 00	....	....	
1860	Port Jervis	N. Y.	20,000	100	—	Do.	3,000	4 10	....	....	
1849	Portland	Me.	300,000	50	4	January & July	30,000	3 00	....	....	
1859	Portland	Oreg.	50,000	50	—	Do.	3,500	8 00	....	....	
1859	Port Lavacca	Texas.	50,000	100	—	Do.	2,500	7 00	....	....	
1851	Portsmouth	N. H.	70,000	100	3	April & October.	6,500	3 70	....	....	
1855	Portsmouth	O.	50,000	50	4	January & July.	10,000	3 50	....	....	
1855	Portsmouth	Va.	100,000	50	4	Do.	4,000	4 00	....	....	
1856	Pottstown	Pa.	20,000	50	3	Do.	3,500	4 00	....	....	
1850	Pottsville	Pa.	110,000	50	2	Do.	10,000	3 50	....	....	
1850	Poughkeepsie	N. Y.	84,000	25	4	March & September.	15,000	3 50	120	110	
1848	Providence	R. I.	1,000,000	50	4	January & July.	60,000	3 00	122	....	
1858	Quincy	Ill.	300,000	50	4	June & December.	12,000	3 50	....	....	
	Quincy	Mass.	60,000	00	—	Do.	00,0 0	0 00	....	....	
1855	Racine	Wis.	42,500	26	—	Do.	7,000	3 50	....	....	
1857	Rahway	N. J.	50,000	20	—	January & July.	5,000	4 00	....	....	
1858	Raleigh	N. C.	25,000	100	6	May & November.	5,000	6 00	....	....	
1848	Reading	Pa.	160,000	25	4	January & July.	25,000	3 00	....	....	
1851	Richmond	Va.	241,975	—	—	City Works.	30,000	3 00	....	....	Jeff. Davis has extinguished the gas-lights of Richmond, Va.
1859	Richmond	Mass.	40,000	25	—	January & July.	3,000	4 00	....	....	
	Richmond County	N. Y.									
1859	Ripley	O.	25,000	50	—	April & October.	2,000	4 00	....	....	
1852	Rochester	N. Y.	200,000	50	5	January & July.	50,000	2 50	....	....	
1857	Rockford	Ill.	40,000	50	—	Do.	4,000	4 00	....	....	
1854	Rock Island	Ill.	100,000	50	—	Do.	6,000	4 50	....	....	
1854	Rockland	Me.	50,000	100	—	Do.	6,000	4 40	....	....	
1852	Rome	N. Y.	85,000	100	3½	Do.	10,000	3 50	....	....	
1854	Rondout and Kingston	N. Y.	63,150	20	3½	June & December.	10,000	3 80	....	....	
1854	Roxbury	Mass.	150,000	100	5	January & July.	20,000	3 00	....	....	
1859	Rutland	Vt.	20,000	25	—	Do.	4,000	3 50	....	....	
	Saco	Me.	71,600	100	3½	April & October.	8,000	4 00	....	....	
857	Sacramento	Cal.	500,000	100	—	Do.	40,000	10 00	....	....	
1850	Sag Harbor	N. Y.	20,000	—	—	Do.	4,000	4 00	....	....	
1856	Saint Albans	Vt.	15,000	20	—	Do.	3,000	7 00	....	....	
	Saint Johnsbury	Vt.	30,000	25	—	Do.	4,000	4 00	....	....	
1857	Saint Joseph	Mo.	50,000	100	5	January & July.	6,000	5 00	....	....	
1859	Saint Louis	Mo.	600,000	50	—	June & December.	180,000	3 50	....	....	
1857	Saint Paul	Min.	200,000	50	3	January & July.	10,000	6 00	....	....	Surplus $10,000, May 15, 1863.
1856	Salem	N. J.	30,000	25	3	Do.	5,000	3 86	....	....	
1850	Salem	Mass.	200,000	100	4	February & August.	80,000	3 24	....	....	
1859	Salem	O.	25,000	20	—	Do.	3,000	3 00	....	....	
1859	Salisbury	N. C.	14,600	50	6	May & November.	3,500	6 00	....	....	
	Salisbury Mills	Mass.	1,250	25	—	Do.	3,000	4 00	....	....	
	Salmon Falls	Me.	25,000	100	—	Do.	3,000	4 00	....	....	
	San Antonio	Texas.	75,000	20	—	Do.	40,000	6 00	....	....	
854	Sandusky	O.	75,000	50	—	April & October.	9,000	3 00	....	....	
859	Sandwich	Mass.	10,000	—	—	Private Works.	2,000	3 50	....	....	
1852	San Francisco	Cal.	2,000,000	100	4½	Do.	100,000	6 50	100	....	
	San Jose	Cal.							....	....	
1858	Saratoga Springs	N. Y.	89,000	100	—	January & July.	6,000	3 60	70	....	
	Saugerties	N. Y.	30,000	20	—	Do.	4,000	3 00	....	....	
1849	Savannah	Ga.	200,000	25	5	Do.	10,000	3 75	....	....	
1851	Schenectady	N. Y.	50,000	—	—	Private Works.	11,000	4 00	....	....	
1858	Scranton, Gas and Water	Pa.	100,000	25	—	January & July.	6,000	3 80	....	....	About trying Water-Gas.
1857	Selma	Ala.	20,000	100	—	Do.	2,000	5 00	....	....	
1856	Seneca Falls and Waterloo	N. Y.	80,000	50	3	Do.	10,000	4 00	100	....	
	Shreveport	La.	40,000	25	—	Do.	3,000	0 50	....	....	
1856	Sing Sing	N. Y.	40,000	100	—	Do.	3,000	3 50	....	....	
	Smyrna	Del.						4 00	....	....	Petroleum Gas.
1860	South Adams	Mass.	10,000	25	—	Do.	3,000	4 00	....	....	
1859	South Bridge	Mass.	5,000	25	—	Do.	4,010	6 00	....	....	
	South Boston	Mass.	200,000	50	—	Do.	60,000	3 25	110	....	
—	Springfield	O.	200,000	100	—	Do	20,000	3 50	....	....	
1854	Springfield	Ill.	75,000	50	—	January & July.	10,000	3 50	....	....	
1848	Springfield	Mass.	160,000	500	5	February & August.	10,000	3 60	140	....	
1855	Stamford	Ct.	6,250	25	5	April & October.	3,000	3 50	....	....	
1857	Staten Island	N. Y.	150,000	50	5	January & July.	20,000	4 00	95	....	

GAS-LIGHT COMPANIES IN THE UNITED STATES.—Continued.

Compiled from official sources expressly for the AMERICAN GAS-LIGHT JOURNAL.

CORRECTED BY JOHN B. MURRAY & CO., No. 11 BROAD STREET, NEW YORK, SHARE BROKERS.

When Chartered.	Town.	State.	Chartered Capital.	Par Val. per Sh. $	Semi-Ann'l Div'd.	Dividends Payable.	Population of Gas District.	Price per 1000 Feet.	Asked pr. cent.	Offered pr. cent.	REMARKS.
1853	Staunton	Va.	18,000	50	6	January & July.	4,000	7 00	....	....	
	Steubenville	O.	150,000	100	—	Do.	15,000	4 00	....	....	
	Stockton	Cal.	50,000	—	—	Do.	8,000	10 00	....	....	
1848	Syracuse	N. Y.	125,000	25	5	March & September.	25,000	3 00	112	....	
	Tamaqua	Pa.	40,000	25	—	Do.	3,000	4 00	....	....	
1859	Tarrytown and Irvington	N. Y.	70,000	50	—	January & July.	3,000	4 00	....	....	
1853	Taunton	Mass.	100,000	50	4	Do.	10,000	4 00	....	....	
	Terre Haute	Ind.	100,000	100	—	Do.	3,000	4 00	....	....	
	Thomsonville	Ct.	25,000	50	—	Do.	4,000	4 50	....	....	
	Tiffin	O.	25,000	20	—	Do.	4,000	4 00	....	....	
1853	Toledo	O.	100,000	50	3	Do.	8,000	3 50	....	....	
1847	Trenton	N. J.	100,000	20	4	Do.	15,000	3 42	....	110	
1848	Troy	N. Y.	200,000	100	4	June & December.	35,000	3 00	100	....	
1856	Urbana	O.	30,000	25	—	April & October.	3,500	4 00	....	....	
1849	Utica	N. Y.	80,000	100	4	Do.	22,000	3 60	....	....	
1853	Vicksburg	Miss.	66,000	50	—	March & September.	4,000	4 50	....	....	
1850	Vincennes	Ind.	25,000	100	—	January & July.	2,000	4 00	....	....	
1863	Virginia City	N. T.					20,000				
1853	Walden	N. Y.	2,500	—	—	Private Works.	1,000	6 00	....	....	
1853	Waltham	Mass.	100,000	100	4	January & July.	3,000	4 00	....	....	
1857	Ware	Mass.	30,000	20	—	Do.	3,500	4 00	....	....	
1861	Warren	O.	30,000	50	—	Do.	4,000	3 00	....	....	
1854	Warren	R. I.	20,000	25	—	Do.	3,000	4 00	....	....	
1855	Washington	D. C.	500,000	20	5	Do.	50,000	2 61	....	100	
1859	Washington	N. C.	15,000	100	—	April & October.	1,500	6 00	....	....	
1848	Washington	Pa.	20,000	25	4	January & July.	4,000	3 00	....	....	
1854	Waterbury	Ct.	100,000	25	—	Do.	4,000	4 00	....	....	
1852	Waterford	N. Y.	12,000	25	—	Do.	4,000	4 00	....	....	
1852	Watertown	N. Y.	20,000	100	—	Do.	10,000	7 00	....	....	
1856	Watertown	Wis.	25,000	100	—	Do.	5,000	5 00	....	....	
1858	Wautoma	Wis.	20,000	50	—	Do.	3,000	4 50	....	....	
1857	Waverly	Miss.	20,000	100	—	April & October.	4,000	5 00	....	....	
1854	West Cambridge	Mass.	60,000	100	—	February & August.	10,000	4 00	....	....	
1852	Westchester	Pa.	100,000	25	2½	Do.	3,500	3 50	....	....	
	Westfield	Mass.	25,000	100	6	Do.	4,000	4 00	....	....	
	Weston	O.	20,000	25	—	Do.		5 00	....	....	
1857	West Point	N. Y.	50,000	—	—	United States Military	Academy.	2 00	....	....	
1853	West Troy	N. Y.	100,000	50	3	January & July.	10,000	3 60	85	....	
1850	Wheeling	Va.	75,000	25	6	Do.	12,000	2 70	....	....	
	White Plains	N. Y.	20,000	20	—	Do.			....	....	
1856	Wilkesbarre	Pa.	50,000	50	—	May & November.	4,000	3 33	100	80	
1850	Williamsburg	N. Y.	1,000,000	50	5	January & July.	60,000	3 00	....	....	
1858	Williamsburg	Va.	30,000	25	—	Do.	3,000	4 00	....	....	Camp-fires of the Union Army light up this place at present.
1857	Williamsport	Pa.	70,000	25	4	Do.	3,500	3 80	....	....	
1859	Willimantic	Ct.	12,000	—	—	Do.	2,500	3 50	....	....	
1853	Wilmington	N. C.	60,000	50	5	Do.	8,000	5 00	....	....	
1852	Wilmington	Del.	200,000	50	5	February & August.	20,000	3 00	....	....	
1854	Winchester	Va.	36,000	50	6	January & July.	5,000	4 00	....	....	
1861	Windsor	Vt.	20,000	25		Do.	2,000	6 00			Make Petroleum Gas.
	Woburn	Mass.	20,000	—	—	Do.	3,000	4 00	....	....	
1856	Woodstock	Vt.	10,000	50	4	Do.	4,000	6 00	....	....	
1853	Woonsocket	R. I.	82,000	100	4	April & October.	4,000	3 50	....	....	
1856	Wooster	O.	25,000	50	—	January & July.	6,000	3 00	....	....	
1849	Worcester	Mass.	160,000	100	5	Do.	15,000	3 50	....	....	
1853	Xenia	O.	40,000	50	—	Do.	8,000	4 00	....	....	
1854	Yonkers	N. Y.	100,000	50	3½	Do.	10,000	3 50	110	16½	
1849	York	Pa.	40,000	57	3	June & December.	10,000	3 50	....	....	
	Yorkville	S. C.	20,000	25	—	Do.	4,000	4 00	....	....	
1858	Ypsilanti	Mich.	20,000	50	5	February & August	6,000	14 00	....	....	
1850	Yreka	Cal.	30,000	100	—	Do.	2,000	0 00	....	....	
1848	Zanesville	O.	44,600	25	4	Do.	10,000	3 00	....	..	

GAS-LIGHT COMPANIES IN THE BRITISH PROVINCES OF NORTH AMERICA.

When Chartered.	Town.	Province	Chartered Capital.	Par Val. per Sh. $	Semi-An'l Div'd.	Dividends Payable.	Population of Gas District.	Price per 1000 Feet.	Asked pr. cent.	Offered pr. cent.	REMARKS.
1854	Belleville	C. W.	33,040	100	4	January & July.	1,200	5 00	....	....	
1854	Brantford	C. W.	32,000	100	2½	Do.			....	....	
	Brockville	C. W.	50,000	—	—	Do.	5,000	4 00	....	....	
	Chatham	N. B.	50,000	—	—				....	....	
1854	Charlotte Town	P. E. I.	50,000	100	5	Do.	3,000	3 50	....	....	
1857	Cobourg	C. W.	30,000	—	-	February & August.	4,000		....	....	
	Dundas	C. W.	30,000	—	—	Do.	6,000	4 00	....	....	
	Frederick	N. B.	50,000	—	—	Do.			....	....	
1848	Halifax	N. S.	160,000	40	7	May.	30,000	3 00	....	....	
1850	Hamilton	C. W.	125,000	40	5	March & September.	20,000	3 50	....	....	
1848	Kingston	C. W.	80,000	100	—	Do.	6,000	3 50	....	....	
1858	London	C.-W.	100,000	20	5	May & November.	5,000	5 00	....	....	
1847	Montreal	C. E.	400,000	40	—	March & September.	110,000	2 80	....	113	Last sale at this figure.
1854	Ottawa	C. W.	40,000	40	5	Do.	5,000	4 50	....	....	
1859	Point Levi	C. E.	25,000	25	—	January & July.	4,000	3 50	....	....	
1859	Port Hope	C. W.	28,000	20	4	May & November.	4,500	3 50	....	....	
1847	Quebec	C. E.	200,000	200	4	January & July.	60,000	3 00	....	....	
1848	Saint Catherine's	C. W.	80,000	20	—	May & November.	7,000	4 50	....	....	
1850	Saint Hyacinthe	C. E.	15,000	20	—	Do.	4,000	4 00	....	....	
	Saint John	N. B.	170,000	85	4	June & December.	25,000	3 00	110	110	Sales at this figure.
	Saint John's	N. F.	50,000	—	4	Do.	30,000		....	....	
1858	Sorel	C. E.	14,000	20	4	Do.	4,000	3 00	....	....	
1848	Toronto	C. W.	400,000	50	—		50,000	3 00	....	....	This Co. pay a quarterly div. of 2 per ct.

GAS-LIGHT COMPANIES IN CUBA, MEXICO, SOUTH AMERICA AND NEW ZEALAND.

When Chartered.	Town.	State.	Chartered Capital.	Par Val. per Sh. $	Semi-An'l Div'd.	Dividends Payable.	Population of Gas District.	Price per 1000 Feet.	Asked pr. cent.	Offered pr. cent.	REMARKS.
	Callao	Chile.		—	—	January & July.	20,000	7 00	....	....	
	Cardenas	Cuba.	50,000	—	—	Do.	180,000	5 00	....	....	
1857	Compania Cubana	Hav'a.	500,000	500	10	Do.			....	....	
	Cienfugos	Cuba.		—	—	Do.	12,000	5 00	....	....	These four towns are lighted by the Compania Cubana of Havana.
	Guanabacoa	Cuba.		—	—	Do.	14,000	5 50	....	....	
	Regla	Cuba.		—	—	Do.	10,000	5 00	....	....	
	Trinidad	Cuba.		—	—	Do.	16,000	5 00	....	....	
	Guines	Cuba.		—	—	Do.			....	....	
	Guyaquil	S. A.	150,000	—	—	Do.	35,000		....	....	
	Havana	Cuba.	2,000,000	500	—	Quarterly.	200,000	5 00	....	175	
	Lima	Peru.	100,000	—	—	January & July.	150,000		....	....	
	Maranham (Chartered)			—	—	Do.			....	....	
	Matanzas	Cuba.	50,000	—	—	Do.	180,000	8 50	....	....	
	Mexico City	Mex.	550,000	—	—	Do.			....	....	
	Montevideo	S. A.	500,000	—	—	Do.			....	....	
	Para (Chartered)			—	—	Do.			....	....	
1854	Rio de Janeiro	S. A.	1,000,000	500	7½	Do.	300,000	4 00	....	....	
	San Iago	Chile.	500,000	—	—	Do.	180,000	7 00	....	....	
1857	Saint Jago de Cuba	Cuba.	450,000	500	—	Do.	25,000	5 00	....	....	
	Valparaiso	Chile.	500,000	—	—	Do.	85,000	6 00	....	....	
	Vera Cruz	Mex.	500,000	—	—	Do.			....	....	
	Vi le Clara	Cuba.	50,000	—	—	Do.			....	....	
	Auckland	N. Z.		—	—	Do.			....	....	

ILLUMINATING GAS.

All kinds of illuminating gas, and, in fact, almost all the materials used, or that can be used *economically*, as sources of artificial light, are composed essentially of two only of the 60 or 70 known elements of matter.

These two elements are *carbon* and *hydrogen*.

Carbon is that transcendently important element which forms the fundamental nucleus of everything that has life; of the whole animal and vegetable kingdoms; while hydrogen is the basis of all pervading substance, water, an indispensable ingredient of the food of all plants and animals. It follows, therefore, in the course of nature and necessity, that in all animal and vegetable matter these two elements, carbon and hydrogen, are found associated together, usually in companionship with more or less of that great Spirit of Life and of Death, called *oxygen*.

Both these elements, carbon and hydrogen, when isolated from the oxygen with which they are combined, are found to be susceptible of the phenomenon called combustion, that is of combining again with the oxygen of the air, with production of the apparition called *fire*.

In the case of hydrogen, however, when thus isolated, we find a gas, which burns with great heat, but *no light;* and in order to cause it to evolve light also, some solid body, capable of being heated to whiteness without change, must be introduced into its flame. Carbon is such a solid body.

Among the frugal, though sublime economies of our kind mother, Nature, a most important and admirable provision—one of those special arrangements so clearly intended and devised for the behoof of mankind—is this storing up together, in vegetable matter, of carbon and hydrogen; and our admiration is enhanced, if possible, when we consider that the *relative proportions* in which they are thus stored up are approximately those most suitable for the production of light as well as heat; for had plants contained less carbon and more hydrogen than at present ordered, it cannot be doubted that much more difficulty would have been encountered in providing cheap sources of artificial light. As it is, carbon and hydrogen having been thus stored up in the most convenient proportions in such masses, it remains for man, by the application of his intellect—God-given for the purpose—to discover and devise the most advantageous modes of reversing nature's operations, and extracting the pabulum of life and comfort from her complex vegetable productions.

These reflections make manifest to us one of those wondrous harmonies in the grand symphony of creation, one of those "thoughts of God" which are developed to us by science. The sun pours upon our earth intermitting floods of light and heat, and these two principles, so essential to the life of man, are continually being stored up for his use by plants growing in the sunshine, in the forms of carbon and hydrogen, which two elements we may metaphorically call the Spirits of Light and Heat. Thus have wood, and in the lapse of countless ages, coal, being created as vast and practically illimitable reservoirs of fire and light, to be drawn upon by the periodic absences of their primal source, the sun.

It has been found that if heat is applied to these vegetable products, *in a close vessel*, from which the oxygen of the air is excluded, such as a gas retort, it will cause a great part of the carbon and hydrogen to be evolved in combination with each other, forming certain compounds not pre-existent in the vegetable matter. The number of these compounds is very great, and many of them have as yet not been discovered, or isolated. Some of them burn with a brilliant light, others with little or none. Some differ in their proportions of carbon and hydrogen, others form classes precisely alike in these proportions. They are not all *gases*, but many—in fact, by far the greater number of these yet known—are, at the ordinary temperature, *liquids;* and some of them are *solids*.

It follows, therefore necessarily, that the substances which pass off from the gas retort, separate themselves, on cooling, at least approximately, into these three classes of products, the liquids and solids condensing together and forming tar, whilst the permanent gases and vapors, incapable of condensation at the ordinary temperature, pass on to the purifiers and gas-holders.

Now, were this separation a *precise* and absolute one, it would greatly simplify the consideration of these complex phenomena; but it happens in reality that this separation is far from being absolute, the permanent gases always carrying with them, in the form of vapor, and pertinaciously retaining, for a longer or shorter time, and in greater or less quantity, according to circumstances, not only portions of the volatile liquid products, but even of the *solid* ones.

In specifying these products by name, we shall be obliged to select those only which possess the greatest interest and importance for us at present, neglecting many which exist in but small quantity.

The *permanently* gaseous products, which are incondensible into liquids at any ordinary temperature are

1.	2.
Acetylene (in minute quantity),	Hydrogen.
Olefiant Gas, or Ethylene,	Marsh Gas,
	Carbonic Oxyd, &c.

Of these only those two in the first column burn with a bright flame, the other three burning with pale blue flames, without light, though giving great heat. Acetylene, olefiant gas and marsh gas, are composed of carbon and hydrogen, while carbonic oxyd is the form into which the greater portion of the oxygen of the coal passes.

The most important products which, though gases at the temperature of the retort, condense more or less perfectly, when cooled, into liquids, are

1.	2.
Naphtha,	Kyanole or Aniline,
Benzole,	Creosote,
Toluole,	Carbolic Acid,
etc.	etc.

By *naphtha* is here designated the mixture of hydrocarbon liquids more volatile than benzole, which can be condensed from the gas by cold.

The chief solid products are naphthaline, paranaphthaline, paraffine, &c.

As before stated, it is found that the permanent gases always carry with them, into the gas-holders, in the form of vapor, portions of the naphtha, benzole, aniline, etc. A portion of the naphthaline also—a substance which, though solid at the ordinary temperature, melts and boils at the heat of boiling water—is retained in the form of vapor, and, at times, even found deposited in portions of the gas mains most remote from the works.

To avoid confusion, we shall hereafter speak of these vapors collectively as *naphtha vapors*.

All these naphtha vapors, however, condense and separate on exposure of the gas to a sufficient degree of cold; and when it is further stated that the presence of these substances greatly enhances the illuminating power of the gas, the important influence of the extraneous condition of *atmospheric temperature* on the gas manufacture at once appears. On the one hand, it would appear desirable to so conduct the operation as to produce gas richly impregnated with these highly illuminating naphtha vapors; but, on the other hand, the least reduction of temperature would not only diminish the lighting power of such a gas, but would lead to condensations of liquids in the pipes and meters, producing flickerings, sudden extinctions of the burners etc. It is considered far better to produce the largest possible proportion of permanent light-giving gases, condensible into liquids by no ordinary cold. The element of atmospheric temperature is so important that it is customary to use in the winter season, a mixture of materials different from that used in the summer. Thus the New York gas companies use in winter a mixture of equal weights of cannel and caking coal, and in summer but one-third cannel to two-thirds caking.

Notwithstanding this, and other precautions, however, the naphtha vapors, during cold winter weather, will condense more or less, and collect in the pipes near the works, and especially in and upon the surface of the water in the huge gas-holders, the quantity in time becoming very large and causing very great embarrassment to the manufacturers. Were there any means of drawing off or cleaning out these condensed matters without suspending the use of the apparatus and stopping off the gas, no harm would follow; but as it is, when continued mild weather arrives in the spring, a phenomenon occurs, much more interesting to men of science than to the gas consumers and manufacturers, the latter of whom are obliged to listen to the bitter complaints and abuse of their customers, without the power to remedy the evil. In short, the gas then takes up again, in the form of a vapor, the condensed naphtha, but unfortunately in such superabundant quantities that it becomes too highly carbonized, and besides being subject to the embarrassments above mentioned (from recondensation in the service pipes and meters), is liable to burn with a dense flame, giving off clouds of smoke and soot, like raw spirits of turpentine. The only means of rectifying this latter evil is to use burners which would give a smaller flame, a resort to which the consumers usually find highly objectionable.

The influence of temperature upon the proportion of naphtha vapors taken up and retained by the gas, may be made clearer by considering the parallel case of temperature on *atmospheric moisture*. Every one knows that summer air is usually highly impregnated with water, in the form of vapor, and that the least reduction of temperature causes condensation of this water in quantities; as, for instance, when a glass is filled with ice-water in such an atmosphere. Even the coldest winter atmosphere is susceptible of containing more or less water, in the form of vapor, as any one will admit who recollects having watched a column of escape steam from an engine rising in the atmosphere. Sooner or later, however intensely cold the weather may be, it wholly vanishes, melting away "like the baseless fabric of vision."

After the above preliminary considerations, we are prepared to enter more understandingly upon the history of the special subject of this essay—the so-called "water-gas" manufacture.

The introduction of gas into public use as an illuminator, may be said to have been coeval with the nineteenth century; its application for lightning numbers of large factories in England dating in the earliest years of this century, though it was not until the year 1815 that Paris was lighted by gas. Early in the third decade of the century, we find the first record on the long list of inventions aiming at the use of water as a source of constituent material for illuminating gas. Two English patentees, Messrs. Vere & Crane, patented in 1823 the introduction of water or steam into a gas retort while in operation. About one year subsequently, Mr. John H. Ibbetson is found to have patented substantially the same thing. Whether these men were mere random and empirical experimentalists, as seems probable, or entertained an expectation of modifying the gas in some beneficial way by the action of the aqueous vapor, I have been unable to ascertain. It seems, however, that here the matter rested for six or seven years, when a new crop of patents sprang up. In the year 1830, Messrs. Pinkus & Collier proposed to pass into a coal gas retort "an excess of ammoniacal or hydrogen gas." In the same year, Michael Donovan secured a patent for conferring illuminating power upon the gaseous mixture evolved when steam is passed over red-hot coke, by impregnating these gases with the vapors of oil of turpentine, of naphtha, or of the volatile portions of coal tar. Donovan was probably aware of the phenomena described above as occurring during the ordinary manufacture of gas—namely, the taking up, by the gas of a portion of naphtha vapors, and the enhancement of the lighting power of the gas resulting therefrom—and sought to reproduce these conditions cheaply with the gases made from water. Another step was taken in the next year 1831, in the patent issued for what is known as "Lowe's Naphthalizing Apparatus," proposed to be attached to the burners in cases in which the gas was too poor to give the required light, and consisting of a vessel through which the gas passed over extended surfaces of liquid naphtha, so as to become saturated with its vapor. This very simple device has been since revived, in a great multitude of forms, from time to time, but many practical obstacles seem to have interfered with its general adoption.

After the lapse of three years more, we find that several Frenchmen have been occupied in this field of experiment; patents having been granted during 1834 to Messieurs Selligue, Jobard and Mollerat, for processes which seem to be similar to that of Donovan. Selligue's plan, which made a great noise at the time,

consisted in passing water gas, made by introducing water gradully into a retort full of red hot charcoal, through another retort full of red hot pieces of iron, over which he caused to flow a stream of so-called "shale oil," or "oil of schist"—a material much in vogue at that period, procured by the distillation of certain bituminous shales. The water gas was enriched by the illuminating gases evolved from the shale oil. We shall return to Selligue's process again. In the next year after these Frenchmen, 1835, comes an English patentee, Mr. Gilbert Sanders, who tried very hard to get rid of the carbonic acid which water gas, as previously made from steam and red hot carbon, always contains in large proportion; but it is stated that he did not succeed satisfactorily in so doing.

From this date down to the present time, the water gas patents have been very unlike "angels' visits;" increasing in number nearly every year, and repeating themselves over and over again in that bewildering manner which is so incomprehensible to all but those who make a study of the historical development of inventions, and who know that inventors, with few exceptions, always work without troubling themselves to inquire what has been done before them by others. Of these numerous "inventions" we can only select and briefly allude to a few of the most important, referring for a more complete chronological view to the Appendix.

The patents of Stephen White, issued in 1847 and 1849, must be mentioned, not on account of any special amount of originality in them, but because a factitious importance has been attached to them by divers British chemists of note, who have experimented upon the manufacture of water gas, by constantly speaking of the water gas manufacture generally as "White's process;" though it is hard to find anything attributable exclusively to Stephen White, either in his methods or apparatus, unless it be his wholly impracticable suggestion to ignite the masses of iron wire in his retorts *by voltaic currents.*

Mansfield's patent of 1847, deserves mention; he being the orignator, I believe, of the plan of applying Lowe's napthalizing device to the conversion of *atmospheric air* into an illuminating gas, by simply impregnating it with the vapor of pure benzole, prepared by methods originated by himself. A Frenchman, Gillard, in 1849, proposed to obtain hydrogen by the decomposition of water, purely by mechanical means (by the magneto-electric machine), afterwards rendering this hydrogen illuminating by known methods. Many proposals have, in more recent times, been made to use this plan in case of lighthouses (the necessary power being obtained by means of tide wheels, &c.), and in other cases where mechanical power costs little or nothing.

In 1850 loomed up, before the astonished world, the amous water-gas patent of our compatriot Paine, the famous "catalyzer" of hydrogen, who converted water *entirely into hydrogen* or *entirely into oxygen*, at will, "without leaving a grease spot," and who is said to have frightened large stockholders in coal companies into "selling out."

The next patent of importance to us is that issued in 1851, to our countryman, Henry W. Adams, deserving special notice, because it seems, in a great measure, to anticipate what have been regarded as important original elements in the special water gas project, which we have undertaken to inquire into. Mr. Adams made hydrogen by the action of steam on metallic zinc, heated in a retort to its point of vaporization, proposing to use the oxide of zinc as a pigment, and to charge the hydrogen with carbonaceous gases and vapors, for illuminating purpses. Several other patentees specify the use of hydrogen gas, prepared in any of the known ways (one of which is the action of steam on heated zinc), to be passed into a coal gas retort while in operation, for instance, Pinkus & Collier, 1830; Wm. Radley, 1845; J. P. Gillard, 1849; Alex. M. Bruere, 1858, &c.

That class of water-gas methods which seems to involve the greatest number of elements of probable practical success (that, namely, in which the mixed gases produced by the action of steam upon carbon, at an intense temperature, are afterwards combined with the richly carbureited gases and vapors evolved from cannel and similiar coals), has occupied, under the general misnomer of "White's process," much of the attentive investigation of British chemists and gas manufacturers, and very high and enthusiastic hopes have at times been entertained of the success of some of these plans, even by authorities ranking high among practical and scientific men; but, in practice, little or no satisfactory result has ever followed. Some of the many difficulties encountered may be briefly specified. It has been found impossible to convert the steam entirely into hydrogen and carbonic oxyd; however extended the surface of carbon may be to which the steam is exposed, a portion of it is found to escape its action; and this decomposed steam, when passing into the coal retorts afterwards, operates injuriously; no doubt by oxydizing the olefiant gas. A portion of carbonic acid gas is also always found with the carbonic oxyd, which is very difficult and expensive to remove, and is very injurious if allowed to remain. One experimenter, Barlow, states that if all the carbonic acid is removed, his experiments show a gain of 38 per cent. in illuminating power, over the gas obtained in the ordinary way from the same quantity of cannel coal. Dr. Frankland likewise obtained a gain of from 12 to 108 per cent.; while another chemist, equally entitled to credit, so far as we are entitled to judge, Dr. Fyfe, obtained, in every case, a *loss* of total illuminating power, by the water gas process, amounting in the average to 48 per cent., and attributes the diametrically opposite results of Frankland to his far lower estimate as to the total illuminating value of the gas obtained from the cannel in the ordinary way. One of the greatest of the practical objections appears to be *uncertainty as to the quality of the product*, it being impossible to control the process with precision, and the least variation in the mode of operation having the greatest influence on the results.—*Prof. Wurts.*

PETROLEUM AS A FUEL.

In our issue of the 2d instant we promised our readers some additional information respecting the experiments tried by the Commissioners appointed by the United States Navy Department to ascertain the practicability of using hydrocarbon oils as a substitute for coal in the generation of steam for the purposes of navigation. We will now proceed to give a more detailed account of these experiments, and in the next number of *The Oil Trade Review* we will examine minutely the probabilities or improbabilities of its ultimate success. We consider this course will be acceptable to our subscribers, many of whom, to judge from the letters we have received, are desirous of learning full particulars with as little delay as possible.

From the manner in which the subject has been written upon in the leading daily papers, an impression prevails that the idea of using petroleum instead of coal on railways and on board ships is one of very recent date. Such, however, is not the case; for in our issue of March 7, 1863, we published an account of some experiments tried in Paris, under the patronage of the French Government, and we believe under the same patent which is now the subject of so much interest in mercantile circles. A series of experiments were very recently tried on the St. Helens Railway, under the superintendence of a gentleman who holds an English patent for his invention, very similar in its chief features to that taken out by Messrs. Shaw and Linton, of Philadelphia.

In the experiments under notice, the residuums from refineries and crude oil were used. The apparatus for burning these oils consists of a vertical iron cone, with corrugated recesses extending over its surface. This is placed in the furnace of an ordinary steam-boiler, upon a semi-circular disc, forming a kind of reservoir, which serves to collect such portions of the oil as are not consumed as they descend and spread over the surface of the cone. A continuous supply of oil is introduced by means of a steam jet directed to the point of the cone, with a downward draft, a small wood fire having been previously kindled. The lighter portions of the oil are immediately on their introduction vaporised and carried into the combustion chamber by the current of air, which combines with it in proper portions, forming the compound, capable of burning with more or less intensity. As the heavier portions of the oil gradually descend from one recess to another, they are evaporated by coming in contact with a stronger heat than can exist at the apex of the cone, which is in immediate contact with the current of cool air. The vapor thus generated passes with the other to the combustion chamber, leaving, as may be supposed, but a very small proportion of waste material. A series of small iron tubes are placed within the boiler, and connect it with the combustion chamber, and in the instance referred to the volume of flame was so great as to pass through the tubes and heat the lower portion of the smoke-pipe red-hot. Two small auxiliary steam-engines are also required—one to operate on the pump for supplying water to the boiler, and another, of much smaller dimensions, to provide a steam jet previous to firing the oil, in the absence of other means of procuring the necessary current of air until the steam is raised in the larger boiler.

The operations of the Commissioners, through favorably reported upon, were not conducted upon a scale of sufficient magnitude to warrant them in speaking positively as to the general result. They, however, strongly urge upon the United States Government the importance of renewing the trial upon a much larger scale, suggesting that some of the navy ships should be used for the purpose, the present locomotive boilers belonging to which could be readily adapted without any considerable outlay. The times for generating steam from water of equal temperatures were, for the oil an average of twenty-eight minutes, and for the coal sixty minutes, or a percentage in favor of the oils of 114.3 per cent. The time occupied in completely extinguishing the fire in the use of oils was about sixteen seconds.—*London Grocer.*

GAS IN INDIA.

"The Singapore Gas-Works, at Rochore are now, by the energy of Mr. Wells, the engineer, so far completed as to illuminate with gas the buildings and premises occupied by the company. Christmas-eve was the first occasion of coal gas illumination in Singapore, and this marks a bright era in the history of this central depot. There is, perhaps, scarcely a town of its size and number of inhabitants, now about 100,000, which presents, especially throughout its outskirts, a more gloomy, dreary, deserted, disconsolate and uninviting appearance than Singapore, when the evening shades prevail.

"So that gas-light is here as desirable for its bestowal of comfort, and inspiring cheerfulness, as for its usefulness as a guide and companion, and its security as a protection to life and property. The benefit and safeguard conferred by efficient gas-light, is quite equal to that of a greatly enlarged police, and the pleasure and safety of a visit to the town by night is greatly enhanced.

"The company's building is now entirely lighted by gas, and the cheerful brillance so pleasingly diffused throughout its apartments is a delightful contrast to the murky duskiness of the surrounding neighborhood. The whole of the building operations of the company are completed, and there remain but the iron roof now discharging from the *Early Dawn*, to be placed over the large brick works, and the retorts, &c., the *plant*, as it is technically termed, to be put up. All the iron work is now in progress and partly finished."

A special meeting of this company is convened for the 4th April, to authorize the directors to borrow £10,000, and to give preferential rights to 2,000 of the unissued shares.—*Singapore Daily Times.*

GAS IN ENGLAND.—The directors of the Brighton and Hove Gas Company have been induced to make a reduction in the price of the gas supplied to the town of New Shoreham. The present reduction will be 6d. per 1,000 feet, and a further reduction of 6d. will be made in March, 1865. The superintendent of the Brighton Company was closely questioned, at a meeting on the subject, as to the low price charged at Plymouth. The meeting resolved that the reduction in price promised should begin at Midsummer, 1864, instead of March, 1865.....The Market Rasen Gas Company are now engaged in making considerable additions to their works. An excavation, closely abutting upon Nursery street, has been made for the placing of a second gasometer.

THE AMERICAN GAS-LIGHT JOURNAL is published on the 1st and 15th of every month, and is the recognized official organ of

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C. ELTON BUCK,
ROOMS of the AMERICAN GAS-LIGHT JOURNAL,
No. 39 Nassau st., cor. of Liberty st., opposite the Post-Office.
New York City

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THE
AMERICAN GAS-LIGHT JOURNAL,

PUBLISHED ON 1ST AND 15TH OF EVERY MONTH.

C. ELTON BUCK, ... EDITOR.

WEDNESDAY, JUNE 1, 1864.

A Philadelphia correspondent of the *Scientific American* writes to advocate what is called "a novel plan for supplying gas," but which is as totally devoid of all novelty as it is deficient in practicability. This wild scheme, which the writer is evidently sincere in believing to be worth attention, has been repeatedly brought forward by various persons, and as often summarily disposed of. It consists of proposing that the gas-works be removed from Philadelphia to the mines, "about thirty miles this side of Pittsburg," where coal may be bought for $1 50 per ton. The writer says that "if the gas could be manufactured at the mines, and conducted to the city, a gross saving of from $6 to $8 per ton of coal used, or from $480,000 to $640,000 per year, could be effected." To do this, the writer says:

"Unless the friction be an inseparable obstacle, a small main, say twelve inches in diameter, would be a sufficient conduit-pipe. Such a pipe would cost (say 300 miles) about $3,000,000. An exhausting engine, pumping the gas at the rate of thirty miles an hour (the rate of exhaustion assigned to the Pneumatic Dispatch Company's Works in London) would afford an abundant supply of carburetted hydrogen for our city. The friction, I take it, could be diminished in a number of ways, by lining the main with sheet tin, &c., and by the interposition of station gas-holders at various points on the line. A number of exhausters might, and probably would, still be necessary on so long a main, each one emptying the gas into one of these holders. The gas-meters here also would have to be increased so as to contain say a week's supply for the city, in case of leakage or accident to the main. The main to be laid along the line of the Pennsylvania railroad, over its bridges and through its tunnels, so as to be easy of access in case of accident.

"I intend to look into this matter further, and bring it into shape on paper. The idea, if not new in its main features, may be as to some of its details. The gross savings in this proposed change being per year $640,000. Deduct interest on cost of twelve-inch main per year, $180,000; interest on the cost of laying the main, which I have not estimated; the cost of additional gasometers and exhaust-pumps. There would also be additional, but trifling, expenses for wages of workmen, &c. The cost of gasometers and exhaust-pumps would be counted by tens of thousands of dollars, and not by hundreds of thousands. But at first blush there would seem to be an annual saving of some $200,000—perhaps $300,000—*i. e.*, the interest on from three to five millions of dollars. The works, as they now stand, are taxed to their full working power; there will be a necessity for an additional supply of gas soon. The proposed change would not only cheapen the gas used by us, but enable us to supply intermediate cities and towns from station gasometers, and would also remove from the heart of a populous city works universally felt to be a tolerated nuisance in their own neighborhoods."

The idea of thinking that a twelve-inch main would be sufficient to supply the whole city of Philadelphia, with a population of 750,000 inhabitants, is of itself supremely ridiculous, and about on a par with the other suggestions contained in the letter. The cost of a sufficient main, including the iron, lead, gaskets, labor, and, if the brilliant idea of "sheet tin" be adopted, which would necessitate a special importation of tin plate, the bill for this material, the additional gas-holders, exhausters, and the numerous *ecceteras*, would amount to many millions of dollars, while the losses by leakage, condensation, &c, incident to a distribution extending over three hundred miles, would swell the total amount to an enormous figure.

In Philadelphia, the gas district is some thirteen miles long, and, in order to equalize the pressure over this comparatively small distance, a number of gas-holders and governors are required. The highest point in this district is not more than six hundred feet above tide-water. If not more than two storing gas-holders are required to equalize the pressure in a district thirteen miles long, with a variation of surface of only six hundred feet, how many holders would be required on a line three hundred miles long—a line turning the short and abrupt curves of a railroad, and ascending the Allegheny Mountains, and the intermediate ridges of the great Appalachian chain, with variations of surface from a few feet to several thousand feet above tide-water? When brought down to practical bearings, the idea suggested by our Philadelphia philosopher seems not only extremely absurd, but unworthy even the slight notice we have taken of it, and the scheme deserves to be placed in the class of conceptions to which belongs the process for extracting sunbeams from cucumbers, and other kindred hallucinations.

ANSWERS TO CORRESPONDENTS.

A. B. C., of Conn.—*The report has not been printed, and we are unable to say when it will appear. We will apprize you at the proper time.*

L. E. B., of N. Y.—*You will find the information in Hughes.*

B. C. P., of Pa.—*Yes. A few days will show with what success the matter has been managed.*

W. J. J., of Mass.—*The company now make coal gas. They have abandoned the use of water gas, and had their works altered to coal gas works more than a year ago. How has it been in Marlboro?*

J. B. S.—*We will attend to your request, and send you the returns as soon as possible. Your fears are well founded.*

WATER PIPES WANTED.—We call the attention of iron founders and dealers in pipe to the advertisement of the Board of Public Works of Chicago, which appears in another column. It will be seen that proposals are asked for supplying 500 tons cast-iron water pipes, and that these proposals will be received until eleven o'clock A. M. of June 4th.

THE GAS COAL FOR THE SANITARY FAIR.—One thousand tons of South Leverson gas coal, contributed by Mr. George Elliott, of Liverpool, England, to the Metropolitan Fair, for the benefit of the United States Sanitary Commission, recently arrived from Sunderland, by the ship *Gibraltar*. The freight on this coal was paid by James McHenry, Esq., of London, a native of Philadelphia. The coal was sold by Messrs. E. H. Ludlow & Co., auctioneers. It was started at $10 per ton, and was run up to $13 50, when it was bought for the Manhattan Gas-Light Company of this city.

Mr. Cyrus W. Field stated at the sale that the South Leverson coal is regarded in England as the best gas coal in the world, and that at the present rate of freights, exchange, &c., it could not be landed here for less than $14 22 per ton. The freight on the cargo alone amounted to £1,000 sterling.

WATER-WORKS OF LIVERPOOL, ENGLAND.

At a recent meeting of the Mechanical Engineers' Society, Mr. Thomas Duncan read a paper "On the Mechanical Features of the Liverpool Water-works." For the benefit of those of our subscribers connected with water-works, we give the paper entire:

The question of providing a supply of water for large towns has always been one of deep interest and importance, and must continue to be so. It may safely be stated that, within the last quarter of a century, a greater amount of mechanical skill has been devoted to the improvement of water supply than during any previous period of equal duration, especially in this country; and, although much that was known and practised before has only been modified, or in some instances improved, still a good deal that is comparatively new has been introduced.

In the Liverpool Water-works, forming the subject of the present paper, the supply is partly by gravitation and partly by pumping. The area over which the supply is distributed is nearly sixty square miles, and contains about 600,000 inhabitants. The gravitation portion, designed chiefly by Mr. Hawksley, is the largest, although not the oldest, and has its origin amongst the hills lying between Blackburn and Bolton; the upper portion is distant, in a direct line, from Liverpool about thirty miles. The area from which the water is collected extends to 10,000 acres, and the greatest altitude is 1,700 feet above the ordnance datum, or mean low-water level. The formations from which the water is obtained are the lower beds of the coal measures and the millstone grit. The average rainfall is nearly forty-six inches per annum, and the quantity collected is about seventy-five per cent. of the total rainfall.

The principal reservoirs are formed in the valleys, by embankments thrown across them, intercepting, at various levels, the streams which flow from the hills. The highest reservoir—the Upper Roddlesworth—is now in process of formation; and immediately below it are the Lower Roddlesworth and the Rake Brook reservoirs. From these the water is conveyed by a "goit," or open cutting down to the Anglezark and Rivington reservoirs, whence it passes to the filter-beds at Horwich. The first portion of the works may be considered as terminating at this point. From Horwich the water is carried to Liverpool, through a line of cast-iron pipes, of forty-four inches diameter, broken by a short tunnel less than a mile long, and by the three balancing reservoirs, at elevated points along the line—Aspull, Montrey House, and Prescot—the last being about seven miles distant from the borough. The water is finally conveyed into the various home reservoirs for distribution. The area of the several reservoirs amounts to more than 500 acres, and the quantity of water contained in them, when full, is 3,000,000,000 gallons. At present, about 12,000,000 gallons per day are filtered and distributed in Liverpool and the vicinity, from Rivington.

The mechanical appliances connected with the gravitation portion of the works are as follow:

1. Slide-valves in the embankments.
2. Sluices and floodgates on the open cutting or goit.
3. Self-acting gauges on the goit.
4. Filter-beds
5. Sand-washing apparatus.
6. Float-valve at upper end of tunnel.
7. Self-acting shut-off valves in the reservoirs.
8. Reflux-valves in the reservoirs.
9. Self-acting throttle-valves in the main.
10. Escape-valves on the main.
11. Stop-valves, scouring-valves, and air-cocks.
12. Main or pipe line.

1. *Slide-valves.*—These are of the ordinary description. The casing is of cast-iron, fitted with planed joints; and the screw-spindle is of brass, working through a nut attached to the slide; a brass face is pinned on the side, working against a brass ring pinned on the framing. These valves are placed under all the embankments in double pairs, the spindles being fitted with stuffing-boxes, and carried up, through guides, in the shafts, so as to be worked from the top of the embankments. The valves are nearly alike in size and character in all the embankments.

2. *Sluices on the Goit.*—Near the Rake Brook reservoir

there are a pair of three feet square sluices on the goit, working in cast-iron frames, and moved by a screw-spindle, bevil-gearing, and crank-handle. One man can shut and open these easily with a head of twelve feet on the sluices. At Brinscall Hall Works there are sluices, placed in frames, built in the masonry, worked in slides, by rack and pinion motion, in order to allow of passing away, by the original brook-course, such a quantity of water as will relieve the goit in time of high flood. Again, at White Coppice, where the Black Brook falls into the goit, a set of three sluices is placed, worked by a screw motion. The water of the Black Brook can be caused to flow, either into the goit, or over it, through a wrought-iron trough, as may be found desirable; and thus the water can be rejected, if unsuitable, or if it be necessary to relieve the cutting in time of flood, as at Brinscall Hall.

3. *Self-acting Gauges on the Goit.*—There are two sets of these gauges on the course of the goit—one at Brinscall Row, and the other at White Coppice—provided for measuring off compensation water to mill-owners, giving off a stipulated quantity of water day by day. The gauge consists of a cistern fitted with an inlet pipe from the goit, and an outlet orifice of notch form; a brass plate is fixed on the inside of the cistern, with a thin-edged aperture of the exact size required, so as to give off always the same delivery of water from the cistern with great accuracy. A beam is placed over the cistern, supported on a cast-iron frame, having a stone float attached to one end, and a vertical loaded copper cylinder to the other, both adjusted by screws; the top of the cylinder is above the high-water level in the goit, and the bottom is faced to match the end of the inlet-pipe from the goit. By this arrangement, the area of passage at the bottom of the cylinder is constantly regulated by the float, to correspond with the area of the outlet opening, thereby providing, with ordinary care, for a constant quantity of water flowing off through the gauge. These gauges have been in use for about four years, and have given no trouble beyond oiling and cleaning, and have uniformly acted well.* The relative levels of the gauge and goit are so adjusted that, if there is any water flowing along the goit, the gauge must be supplied before any portion of the water can pass further down the goit.

4. *Filter-beds.*—There are six filter-beds, each 300 feet long and 100 wide, constructed in the following manner: The bodies of the beds are part in excavation and part in embankment, and about ten feet deep. At the bottom of each bed are a pair of dry rubble drains, above and around which is placed a quantity of broken stone, varying from four-inch pieces down to two inches cube; above this five layers of gravel are laid, varying in size of one inch to about the size of peas. On the top of the gravel is a layer of sand thirty inches deep. The water is admitted upon the filter-beds by drains, regulated by stop-planks, and it passes down, through the sand and gravel, into the drains at the bottom. Four air-pipes are inserted into each filter over the drains, to prevent the accumulation of air; these are cast with slots in the side, over which copper wire gauze is fastened, to prevent the sand passing into the pipes. The two drains under each filter-bed unite together into one, and deliver the filtered water into a pit, from which a pipe communicates with the clear-water tank. On the end of the pipe, within the pit, a sluice is placed, worked by a screw-spindle, carried up to the surface; so that any filter-bed may be shut off at pleasure, or all may be in work together. There are two clear-water tanks, extending lengthways across the ends of the six filter-beds, with an inlet from each bed. They contain, together, twelve million gallons, when full, and are constructed with the bottom slightly inclined towards a cleansing outlet, and sloping sides, and are paved with dressed stone. The main pipe, conveying the water to Liverpool, is inserted into these tanks, one branch into each, fitted with sluices, so that either of the tanks may be worked by itself, or both may be used at the same time.

Any solid matter in suspension in the water is intercepted and retained at the upper surface of the sand in the filters. When any of the filter-beds become foul, and the requisite quantity of water will not pass, the supply of water is shut off from that filter, and the water in the clear-water tank is lowered below the surface of the sand in the bed; the upper film of sand, generally about three-quarters of an inch thick, is then removed and washed, and when a sufficient quantity of clean sand is prepared, and the filter cleared, the sand is put on again, and the filter restored to its original condition. Sometimes the filters have worked for six weeks, at other times they have not worked for more than ten days, and, on a few occasions, for not more than a week; fourteen days may, however, be taken as a mean, and the annual cost at £100 for every million gallons filtered daily. This sum provides for replacing the sand lost in the process of washing, where it does not cost more than six shillings per cubic yard laid on the works. The mean quantity of water which will pass through one of the Rivington filters may be taken at half a cubic foot per hour for every square foot of surface.

5. *Sand-washing Apparatus.*—The sand-washing is performed by machinery, consisting of a nearly horizontal spindle with a number of spiral blades upon it, placed in a trough twelve feet long, and driven by a small high-pressure horizontal engine. A stream of clear water flows into the upper end of the trough, and the foul sand is carted into a hopper at the lower end, from which it is fed into the trough by a screw driven by the engine. The screw-blades on the longitudinal spindle then carry the sand forwards against the stream of water to the upper end of the trough, where it is caught by scrapers placed on an endless revolving gutta-percha belt; this works in an inclined trough, and carries the washed sand upwards until it falls into shoots at the top, which convey it into wagons, to be removed for use again in the filters. The head-gearing on the top of the shoots is provided with extension gearing, by which any lengthening of the gutta-percha belt can be taken up; and the shoots are arranged to shut or open as required, so that no sand may fall while a full wagon is being taken away, and an empty one placed under them. Ten cubic yards of sand per hour are washed and loaded into carts by this machine. The idea of this machine was obtained from a small one at Crewe, designed and constructed by Mr. Ramsbottom; the arrangements for self-feeding and loading the washed sand have been added to the original.

6. *Float-valve at Upper End of Tunnel.*—The main or pipe line, commencing in the clear-water tanks, passes across the valley and under the Bolton and Preston Railway, and then enters a hill, distant about two miles from the filtering works. At this point it terminates in a circular tank of brickwork, at the upper end of the tunnel, into which the water is delivered. The pipe is fitted with a sloping end-piece, on which is hinged a flap-valve. When any stoppage takes place on the down-stream side, the water rises in the tank, and, acting upon floats connected by levers to the flap-valve, closes that valve and shuts back the water in the supply-pipe; when, however, the water falls on the lower side, the floats will descend and open the valve again, allowing the water to run free as before. The brick tunnel, about 1,600 yards long, is succeeded by about a mile of pipe, which carries the water to Aspull reservoir, where it is delivered. Aspull and Montreyhouse reservoirs may be considered simply as relieving reservoirs.

7. *Self-acting Shut-off Valves.*—On the outlet-pipe, from the various reservoirs, a self-acting valve is placed, for shutting off the flow of water from the reservoir when a fracture takes place on the pipe line on the delivery-side. The outlet-pipe has an up-turned end, fitted with a brass face, over which is suspended vertically a cylindrical valve of the same diameter, with a brass face on the bottom, fitting the face of the outlet-pipe. In the outlet-pipe is hung a flat disc, at the end of a long lever, presenting its flat face to the current of the water flowing off from the reservoir, and weighted so as to stand still as long as the water flows through the pipe at the proper velocity. But whenever a fracture takes place on the delivery side of the pipe, the current is accelerated, and the disc is thereby thrown forwards; a trigger is thus released and thrown off, and the large suspended cylinder descends on the orifice of the outlet pipe, shutting off all further passage of the water down that pipe. Alarm bells connected with the valves have recently been fitted to each of the cottages at the reservoirs where these valves are placed, so that if the valve runs down, the bell is rung to warn the keeper.

8. *Reflux-valves.*—At each of the reservoirs there is a reflux-valve placed on the end of the inlet pipe supplying the water to the reservoir. This consists of a series of hinged doors or flaps, with brass faces, hung on the orifice of the inlet pipe, which has also brass faces slightly inclined to the vertical. The current of the water entering the reservoir keeps the flaps sufficiently open to admit the water to pass in; but whenever a fracture occurs at a point on the up-stream side, lower than the water in the reservoir, the weight of the valves and the pressure of the water closes them, and so prevents a reflux of the water from the reservoir.

The above description applies to all the self-acting apparatus fitted to the reservoirs, and the only other mechanical appliance in connection with them is the delivery-well at the Prescot reservoir. This is a circular iron tank, into which the main pipe delivers the water, with a reflux-valve fitted on its extremity. From this well the water is conducted into the different compartments of the reservoir by pipes, furnished with slide-valves, which are worked by screw-spindles and bevil-gearing. Any portion or all of the pipes may thus be shut off, or all the communications can be opened together. An overflow-pipe rises in the centre of the well, communicating with an overflow-culvert carried from the well, so that any excess of water is permitted to pass away without injury to the embankments. A series of observations have been carried over many months, taken at fixed periods daily, carefully noted and compared with actual measurements of the quantity of water passing through the main between Prescot and Liverpool; so that, by observing the point at which the weight stands on the lever of the self-acting valve, the quantity of water delivered can be computed and ascertained exactly.

9. *Self-acting Throttle-valves in the Main.*—These valves are designed for a purpose analagous to that of the self-acting shut-off valves placed on the reservoir outlets, but differ considerably in construction. The throttle-valve is placed on a horizontal spindle in the main, and on the outer end of the spindle is a chain-wheel, carrying a heavy weight, which tends to close the throttle-valve, but is prevented from doing so by a trigger catching a stop on the chain-wheel. A flat disc is held in the main at the end of a long horizontal lever, presenting its flat face against the current; and as long as the velocity of the current does not exceed the proper limit, the disc is held stationary by the vertical spindle which carries the disc-lever, being geared by tooth-sectors to a weighed rocking-spindle; and the throttle-valve stands full open, presenting its edge to the stream. When a fracture takes place on the down-stream side, the velocity of the current along the main is increased, and the disc is pressed forwards. This movement releases the trigger, and the weight on the wheel of the throttle-valve spindle descends, turns the throttle-valve across the main, and stops the passage of the water. The spindle of the throttle-valve is placed one and a half inch out of the centre of the valve, so that the pressure of the water may assist the weight in closing the valve. In order to prevent the throttle-valve from closing suddenly, and thereby causing an injurious concussion upon the main by the sudden stoppage of a large column of water, its motion in closing is retarded by a piston working in a small water cylinder; the piston-rod being connected to the wheel on the throttle-valve spindle. A small pipe communicates from the top of the cylinder to a small cistern on the top of the main, and a second pipe from the bottom of the cylinder to the cistern; in the first of these a stop cock is placed, worked by a lever; and, as the chain-wheel turns round, closing the throttle-valve, a stud on the wheel raises the lever, and gradually closes the stop-cock, so that the discharge outlet from the cylinder is throttled, and the closing of the throttle-valve is retarded. When the throttle-valve has to be opened again, a small hand force-pump is used to turn back the chain-wheel into its original position, and open the throttle-valve. These self-acting throttle-valves were furnished by Sir W. G. Armstrong & Co., of the Elswick Works.

10. *Escape valves on the main.*—However slowly the current in a large main is stopped, there will always be, practically, a series of pulsations running backwards to the fountain head from which the water is supplied, their intensity depending on the velocity at which the water was moving when the stoppage was commenced, and on the length of time occupied in arresting the current. To obviate the danger arising from this cause, loaded escape valves have been placed along the line of main, and behind the self-acting throttle valves. These are loaded slightly over the working pressure in the main, and communicate with some convenient water course; so that when the current is stopped, by the closing of the throttle valve, the escape valve is lifted as soon as the recoil reaches it, an escape of some water takes place, and so on at every pulsation, until the force of the recoil falls within the limit to which the valve has been loaded over the working pressure, whereby all danger to the main is prevented.

11. *Stop valves, scouring valves, and air cocks*—At various points along the main are placed stop valves, so that the water may be shut off at convenient distances for facilitating repairs. They are slide valves, formed with three vertical slides, the largest in the centre, and a smaller one on each side, worked by screw spindles. A scouring outlet, closed by a slide valve, is also placed at each brook course or hollow, where practicable, by which the pipes may be scoured out whenever necessary. On each summit along the course of the main a small air cock is inserted into it, to allow the air to escape. These are simple stop-cocks, with short lengths of lead pipe attached, to carry off the waste water from them. It has been found advantageous to leave them slightly open, sufficiently to permit a small quantity of water to escape; this ensures a full main.

12. *Main or pipe line.*—The main is 44 inches internal diameter, and is for its length the largest main yet laid. The pipes are jointed in the ordinary manner, with yarn and lead; for the greatest portion of the length they are strengthened by wrought-iron hoops, shrunk on to the sockets. Between Prescot and Green Lane an additional line of pipe is about to be laid, of 36 inches diameter, with joints bored and turned slightly conical, or with a taper of about 1 in 62 on each side. A single thread of tarred yarn is lapped round the spigot end, to provide a slight elasticity in the joint; and the pipes are then put together with melted asphalte, the socket being slightly warmed at the time, for the purpose of expanding it when pressing the spigot end into its place. Experiments have been made in Glasgow, where these pipes are being cast, from which it is found that joints made in this manner resist a high pressure; and when the ground on which they are to be laid is solid, they are employed with considerable pecuniary advantages. Pipes with these joints have recently been laid, at a saving of 50 per cen. in cost of laying over the ordinary plan of lead joints; and they have been used for water mains in Liverpool, for several years past, with perfect success. Several experiments have been made, to ascertain the amount of deflection that may be safely obtained with pipes jointed with these bored and turned joints. Two pipes of 24 inches diameter were jointed in this manner, and flanges were bolted to the outer ends, with holes for a pressure guage and the pump connecting pipe. They were supported at the ends only, leaving a clear distance of 23 feet unsupported, and were then weighted with 36 cwts. on the centre, which produced a deflection of ¼ inch. A pressure of 190 lbs. per square inch was then applied by the pump, and the joint began to draw slowly, causing the pipe to sink in the centre. A deflection of six inches was obtained before there was any leakage, when the pressure was 160 lbs. per square inch, at which point a slight leakage commenced.

The line of 44-inch main terminates at Green Lane. At Old Swan one branch 24 inches diameter, is taken off to the left, and carried to the Parkhill reservoir, at the south end of the town. Another branch, 24 inches diameter, is carried along Green Lane to the resorvoir at Audley street, for the north end. The main, 44 inches diameter, is reduced to 36 inches, and is carried into the Kensington reservoir. The reservoirs in town are all covered by brick arching, grassed over; and from them the various distributing mains are carried.

The town is divided, for the purpose of the water supply, into three main divisions—north, middle, and south; and these three each into upper, middle, and lower levels. Each of these is again subdivided into sections, so that any one can be shut off without interfering with the othere; and between each main division communications are made, so that they may be supplyed in more than one way.

The old valves which belonged to the old waterworks have been nearly all removed and replaced by screw slide valves of the best make; and in nearly every instance the water supply to the several divisions is regulated by slide valves of the best kind. The connecting ferrules for the service pipes are screwed into the iron pipes, and the lead service pipes are attached without solder. Stopcocks of the best make are fixed on the service pipes in the footways to all new property, but much of the old property is still without this provision, and some years must elapse before the whole can be made uniform.

The hydrants for extinguishing fires, now used in Liverpool, are chiefly laid in the footways. They are simple slide valves with upturned nozzles, and have screws to fit the fire hose. They are placed at convenient distances, generally in pairs, so that several sets of hydrants can be brought into play at a fire if necessary. In Liverpool, engines are not generally used at fires, but the water is thrown direct from the hydrants fixed on the mains. Similar hydrants are laid around all the docks, and are used for the supply of water for shipping. Meters mounted on spring carriages have recently been introduced for the shipping service supplies. When a vessel is to be supplied with water, the waterman wheels the meter close to one of the hydrants, a short length of hose is attached to the hydrant and the meter, and another hose is carried from the outlet of the meter either on board the ship or to casks placed on the quay. The index is taken, the hydrant opened and the supply given, when the quanity supplied is read off the index, and the charge adjusted accordingly. From four to five thousand gallons per hour can be supplied in this way by one meter, and all disputes as to the correct quantity of water delivered, or the size of vessels to be filled, are thereby obviated. The meters generally do not vary more on either side than one per cent. from the correct measurement. A meter, with its carriage complete, costs about £20; and the cost of their repairs, taking the experience of three years, is 1s. 6d. per million gallons delivered.

The flushing cocks or valves are similar in construction to the other slide valves already described. They are used for flushing the sewers, and are carried from the mains at those points where the greatest length of sewer can be flushed by a single cock. An eyelet is carried up to the surface immediately over the junction with the sewer, so that any escape may be seen on inspection from the surface. A peculiar kind of cap is placed over the spindles of these valves, so that they cannot be opened by mistake; such mistakes have occurred, but have been prevented since these caps have been employed.

Up to the commencement of 1857, all the water supplied to Liverpool was obtained from wells in and about the town, sunk in the new red sandstone, the formation of the district, from which the water was pumped by steam power. Immediately before the introduction of the water by gravitation there were seven pumping stations with wells and one pumping station from a reservoir. The wells varied in depth from 130 to 200 feet. There were in all eleven engines, ten of which were generally in work at a time; only a few of these need be noticed.

At Green Lane station there are three engines. The first, by Harvey, of Hayle, has been erected for sixteen years, and with short intervals of rest has been kept working ever since. The second, by Forrester & Co., of Liverpool, was erected in 1852, and has also been almost constantly at work since that time. The third was removed from Bootle Station, and after being thoroughly overhauled and repaired, was put up in its present position in 1855, and has, with the others, been nearly constantly at work. The two first are Cornish engines, and the third a double-acting crank engine.

The pumps of the two Cornish engines are solid plungers, working through stuffing-boxes. The lower plungers are worked by rods of flat bar-iron, attached to crossheads at top and bottom. The length of stroke in each case is 8¾ feet, and the diameter 17¼ and 19 inches respectively. Each of the lower plungers delivers its water into a cast-iron cistern, a few feet below the surface of the ground, into which the wind-bore of the upper plunger dips. The delivery in the case of the first engine is directly into the ascending limb of a stand-pipe, enclosed in the tower containing the chimney; and in the case of the second engine, the delivery pipe is attached to the bottom of the descending limb, whence an 18-inch pipe passes to the 36-inch main, from Rivington, in which both waters are mingled. To the first angine an auxiliary bucket lift is attached, of larger dimensions than the plunger pump; and in order to provide for getting down to the lower plunger, it is constructed to deliver its water at the surface. The valves are all double-beat, the beats being now wholly composed of gutta-percha, which has been found to suit the purpose intended, better than any other material that has been tried. The pump of the third or crank engine is a single-lift bucket pump working into an air vessel. The load on the upper plungers of the two Cornish engines, is about 50 lbs. per square inch, and on the bucket of the third engine, 120 lbs. per square inch.

The boilers to these engines—three to each of the two Cornish and two to the crank engine—are cylindrical, with internal flues. The draught is carried through the flues to the back, returning along the sides, uniting and returning to the back along the bottom, and then into the main chimney flue, which extends across the ends of the boilers, with dampers to each boiler, and to the entrance into the chimney. Each set of boilers is provided with a steam chest; and all are enclosed in brickwork, a small clear space being left, both between the boilers themselves and the steam chest, and the brickwork is levelled up and flagged over. The condensing water from the engines is passed through a set of cooling ponds, and with a slight supplementary supply from the wells, is used over and over again.

The wells from which these engines work are 185 feet deep below the surface, and have tunnels or drifts extending in all about 300 feet from the shafts in various directions: three separate shafts are carried up to the surface. The quantity of water yielded by this well is greater than from any other of the wells of Liverpool, being more than three million gallons daily. A 9-inch diameter borehole has been sunk below the bottom of the well to a depth of 185 feet deeper, which largely increased the quantity of water yielded. The flow from the borehole is regulated by a plug at the bottom of a long rod working in guides, which is raised or lowered by a strong screw at the top, whereby the borehole is opened or shut at pleasure. In preparing for the seat of the pumps attached to the second engine, a diving apparatus was employed, and all rubbish was cleared away from the bottom; thus the difficulty of obtaining a sound good job in fixing the pitwork was greatly diminished.

At Windsor station the pumps are arranged in two lifts—the bucket below, and plunger above; the first delivers the water into a cistern, the second works from the cistern, and into a column or pipe, with the upper end closed, acting as an elongated air vessel, with which the distributing main is connected. Originally it was intended to supply a part of the town direct from this station, and in order to meet the varying load, a balance bob, with a weight, was applied to the engine. To remove this weight every time a change of load took place was found inconvenient, and a small line of rails, with truck and screws, was therefore placed over the balance bob pit, by which one man can in a few minutes make the required change. The boilers are plain cylindrical, without flues, with steam chest on the top, all covered as at Green Lane. Originally much of the surface was left exposed, but now all is covered in, and the effect has been such a saving in fuel as in a short time repaid all the cost of the alterations. The condensing water is worked in a circuit, through a small cooling pond, as at Green Lane.

At Bootle station there are two old double-acting crank engines, with double-acting pumps. Originally they were worked with low-pressure steam; but the old wagon boilers have now been removed and replaced by tubular boilers covered over, and high-pressure

steam with a covered steam-chest has been applied; the saving in fuel thus effected has been thirty per cent. The pumps work into air vessels, from which the mains are carried, supplying the district between the station and the reservoir; and the difference in quantity between supply and demand flows into the reservoir. The wells of Bootle yield about 800,000 gallons daily; they are about 50 feet deep. Some years ago, several boreholes were sunk here—one to the depth of 600 feet below the bottom of one of the collecting wells; at first this yielded a large volume of water, but now it yields a very small quantity.

The other old pumping stations, now seldom or never used, are the Bush, William Henry street; the Park, and Hotham street. At all of these, with one exception, the engines were nearly alike—old and costly to work. There are two pumping stations besides, where there are no wells, but the water is raised for the supply of the high-level district from reservoirs which supply the middle and low levels: these are Audley street and Devonshire place stations.

The Audley street engine is Cornish, made by the Haigh Foundry Company, Wigan. The cylinder is 36 inches diameter, six feet stroke in the cylinder, and six feet stroke in the single plunger pump of 19 inches diameter, which draws from a cast-iron well communicating with the lower reservoirs. The water is raised 92 feet, into a covered tank 75 feet diameter and 10 feet deep, containing a quarter of a million gallons nearly, from which the high levels are supplied. There are no internal ties in the tank, but it is supported entirely from without, at about one-third of its height, by wrought-iron hoops and struts, from the ends of the supporting girders. Self-regulating gauges are attached to the clocks in the engine house, from which traced diagrams ure daily obtained, showing the hour lines and the corresponding depths of the water, at any time, in both the tank and reservoir.

At Devonshire place station, there is a small high-pressure engine, possessing no feature of interest, and expensive in working, which will shortly be superseded by a second Cornish engine, about to be put up at Audley street. This is to have a 50-inch cylinder, with 10 feet stroke, and 29-inch solid plunger. In its general features it will resemble the engine already erected at that station.

Besides the works already described, there are two small reservoirs in progress near the town—one for receiving the water direct from the main from Prescot; and an engine is being made for pumping from a well, in connection with this reservoir, into the second reservoir.

[Advertisement.]

LENOIR GAS ENGINE.

DESCRIPTION AND DIRECTIONS FOR USE.

The gas engine consists of a cylinder laid horizontally on a cast-iron frame, and a piston, which is moved in the cylinder, and which, by a connecting-rod, transmits the motion to the horizontal shaft on which the fly-wheel and motive pulley are fixed. The gas is introduced through the pipe, h, from the regulating reservoir, g, of vulcanized India rubber, which regulates the flow of gas, and prevents any sudden jerking in the gas-pipe.

A tube, K, receives the gas conveyed by the pipe, h, and conducts it to the valve, which opens and closes alternately, by means of a rod set in motion by an eccentric wheel fastened to the end of the shaft.

Two Bunsen's piles, P, sufficient to produce the electricity, are placed at a little distance from, and in communication with a Ruhmkorff apparatus, B. The electric current of this apparatus is conducted, by means of insulated wires, to the distributor, m, placed on the front part of the frame of the machine, and the course of electricity, and its arrival at the inflammator, inserted at each end of the cylinder, is directed by the movement of the piston-rod, which, by an ingenious combination, impels a small movable slide before the distributor.

The burnt gas, after having performed its functions in the machine, escapes, by means of a valve, through a pipe, S, and the water designed to cool the interior of the cylinder enters by a double passage, by means of a pipe situated near the escape-valve, and goes out by the pipe, E.

In this manner the dilated-air motor is constructed. Do you wish to give it motion? Establish the electric circuit; turn the cock of the gas-entrance; start the fly-wheel, and the motor is in operation.

Mr. Levi Foucault, in speaking of this, happily said: "That one could set it in motion or stop it, with the same ease with which he lights or extinguishes a taper."

SETTING.

Place and bolt the engine on a solid foundation, either of stone, brick, or wood. Place the meter as far as possible from the machine, taking care that the size of the meter shall be sufficient to furnish the gas necessary for the capacity of the cylinder:

One half-horse power	requires a meter of		10	burners.
One horse power	"	"	20	"
Two " "	"	"	50	"
Three " "	"	"	60	"
Four " "	"	"	80	"
Five " "	"	"	100	"

In order to feed the machine with regularity, it is necessary to place, between the meter and the engine, the gas reservoir, which is furnished with the machine by the builders. The reservoir should be so placed that it may receive the gas which has passed through the meter, and that it may again receive a supply of gas, and conduct it to the machine.

Fix the water-pipe, which is used to cool the cylinder, provided with a cock to regulate the stream; the pipe for conveying away the warm water ought to be double the diameter of that for the introduction of the cold water, on account of its dilatation. Finally, near the valve by which the burnt gas escapes, fix an iron pipe with the largest diameter which the brass outfall admits, near the escape-valve: that will facilitate the expansion in diminishing the pressure of the escape.

The diameter of the pipes ought to be proportioned to the power of the machine. A large diameter is preferable, because the escape of gas is always regulated by the cock.

DISPOSITION OF THE PILES.

The pile employed is that of Bunsen. It is composed—

1st. Of a dish of stone or earthenware.
2d. Of a zinc cylinder partitioned longitudinally.
3d. Of a porous jar of baked clay.
4th. Of a prism of charcoal.

The zinc and charcoal have on their upper parts copper conductors.

Two elements of the pile are sufficient to operate a machine of from one to four horse power.

Care must be taken that the entire surface of the electric contact of the piles should be polished, by scouring from time to time, with emery paper; for if it is soiled it will produce insulation, interrupting the current of the fluid.

When it is necessary to unite several piles, join the copper conductor of the charcoal of the first to the copper conductor of the zinc of the second, and so forth, so to have a free zinc in the first, and a free charcoal in the last.

AMALGAMATION OF THE ZINC

In order to obtain the most intense and regular current of electricity, amalgamate the zinc cylinder in the following manner: Pour into a wooden trough, or which is better, into a large gutta percha basin, equal parts of water and sulphuric acid of 66 degrees, commercial (oil of vitriol.)

Add to the mixture about 8.040 ounces Troy, of mercury, the residue of which may be saved after the operation.

Instead of amalgamating directly with the mercury, when the acidulated water has been prepared of the suitable strength seven or eight drops of nitrate of mercury may be poured into the earthen jar.

Afterwards rub the zinc cylinders with the compound; the mercury will adhere quickly to their sides, which will become brilliant; the operation is then complete.

When the cylinders have been used sometime, or have remained dry, it is indispensable to recommence the amalgamation.

PREPARATION OF THE PILES.

Fill the earthen jar about one-third full of water, then pour the acid, slowly, stirring with a glass rod, until the liquid indicates eight or nine degrees by the hydrometer—(or fourteen parts of water and one part of sulphuric acid, measured by quantity.)

You can use a graduated glass to obtain the measure of the mixture, without having recourse to the hydrometer.

Take special care always to pour the water before the acid, and never pour the water into pure acid, because it will have a high temperature, and the consequent boiling will project the liquid from the jar.

Place the zinc cylinder in the earthern jar. In the middle of the cylinder place the porous earthern jar containing the charcoal prism. Pour into the last jar a quantity of nitric acid of thirty-six degrees Baumé, so that the level of the liquid may correspond with that of the acidulated water in the first jar, approaching within 0.78 inch of the rims.

Fix the copper conductors to the zinc and to the charcoal.

The charcoal pole is the positive—the zinc pole is the negative.

This is the Bunsen's pile.

Put the piles in communication with the lower copper buttons of the Ruhmkorff 's apparatus

The charcoal to the left button.

The zinc to the right button.

RUHMKORFF'S APPARATUS.

This is a reservoir of electricity intended to increase the intensity of the inflammable sparks of gas in the cylinder of the engine.

Communication is established by means of four buttons fixed by copper screws at one of the ends of the cylinder: with one part, by the lower ones with the piles; with the other part, by the upper ones with the electrical distributor.

ELECTRICAL DISTRIBUTION.

The part which is bolted to the frame of the machine, is thus called, and is insulated by an indurated plate of India rubber.

By contact and friction of the copper slide, also insulated, the spark, necessary for the combustion of the gas, is alternatally evoked; first, in the front, then in the rear, in the interior of the cylinder of the engine, by means of the two insulated wires.

The distributor is composed of two parallel copper bands; the higher one is interrupted in the middle; the lower one is continued. The first part of the higher one communicates by an electric wire with the inflammator of the breach of the cylinder.

The second part of the higher one, near the cylinder, is joined to the foremost inflammator. The lower band is put in contact, by another electric wire, with the left copper button of the higher one of the Ruhmkorff's apparatus. The frame, or every other convenient part of the frame, is put in contact, by another wire, with the right button of the higher one of the Ruhmkorff coil.

MOTION OF THE ENGINE.

Place the fly-wheel at the dead point, so that the connecting rod may go beyond the vertical of the side opposite to the cylinder.

Establish the electric communication; be sure that all the pieces are sufficiently oiled; turn the cock of the meter, and also that of the water which serves to cool the covering of the cylinder.

Turn the double oil cock, placed on the cylinder, but stop it, as soon as the motor is in motion.

The straps should be loosened in order to lighten the work at the start.

In the last place, admit the gas slightly at first, by turning a little the cock under the introduction valve at the same time and in the same direction of the motor shaft; move the fly-wheel with the hand in order to help its start.

Finally, regulate the movement at the speed you require, by turning, more or less, the cock that conducts the gas into the cylinder.

GREASING.

Avoid with care, dry friction, which is generally pernicious to all machinery; but do not oil too much, for it may collect in the cylinder, and at the joints, which would render the sliding difficult.

In the opening made for the packing, through which the piston rod passes, it is preferable to introduce rib grease (*Graisse de Panne*), which has not been melted.

Oil the cylinder with neatsfoot oil, which you will pour in by means of a can such as is used ordinarly in the lubrication of machinery.

GENERAL DIRECTIONS.

Preserve the machinery by cleaning it daily with woolen or cotton rags as soon as you quit working it, and while the pieces are still warm.

When you make a thorough cleaning by taking the cylinder to pieces, examine and scrape the sides of the vents by which the gas enters, and those by which the burnt gas escapes.

Avoid, as much as possible, for rubbing the polished pieces, the employment of emery paper, clay, ochre, sand, dust and all hard substances reduced to powder, for, if any grains remain between the parts rubbed, they will alter them sensibly. It is well in a manufactory to keep the machine in a glass closet. Examine the covering and the pipes through which the water circulates, to see whether, under the influence of heat, the water has not deposited calcareous incrustations, which it will be necessary to scrape off in order to avoid obstructions.

Keep in good condition the packing through which the piston-rod passes, by changing from time to time the hemp. This care is very important to prevent losses and exhaustion. From time to time ascertain whether there is too little or too much water in the box of the meter, either of which is prejudicial to the working of the fly-wheel, and also completely interrupts the passage of the gas. If the moter should remain a long time without work, have the fly-wheel worked occasionally by the hand to change the position and contact of the parts.

After operating a few weeks, if the valves have too much play, fasten with precaution the bolts that keep them in place; but if fastened very tight it will increase the friction. Examine frequently, at least every morning, before work is begun, the inflammators; clean the platina burners and the porcelain buttons with water made strongly alkaline with potash.

It is easy to prove exteriorly the good condition of the functions of the inflammators, by placing them in communication with any part of the frame, and by attaching the electric wire to their upper part, you will see a constant series of sparks emitted from one platina to the other.

Whether good or not, replace the piles every four days, and if you do not wish to lose electricity, remove the zinc cylinders after the work and let them dry, they will last a long time; it is equally useful to take from the acidulated bath-water the porous jars that contain the nitric acid.

The Ruhmkorff apparatus works well when it buzzes trongly; if the buzzing ceases, knock the box a little, to excite it. If it persists in silence it is because electricity is wanting, and the piles ought to be charged anew.

In working the greasing cocks, if the escape in front and in rear proceeds with regularity, it proves that the motor is in good working order; if, on the contrary, you hear only one escape during the entire course of the piston, it is because one of the two inflammators needs cleaning, or because some foreign body obstructs the passage of the electric fluid, which ceases, therefore, to produce sparks.

In localities where water is scarce, it is convenient to erect two reservoirs in order to feed the stream intended to cool the cylinder, with a small feeding pump, they should be made as large as possible, in order that one may cool, while the other is employed.

As water may be condensed in the gas-pipe, place at the lowest position, a tap, to get rid of it; without this the water may form an obstruction in the interior, which may prevent the arrival of the gas at the valve. It is also necessary to permit the free escape of the vapor of the water which comes from the cylinder with the burnt gas, and if it is necessary to have the escape-pipe bent in the form of an elbow, means of egress must be reserved for the condensed water.

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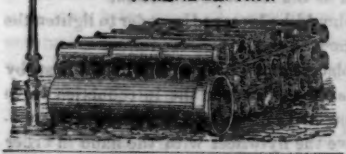

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HYDRAULIC CEMENT SEWER PIPE,
KNIGHT, WOODWARD & CRAWFORD,
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Sewer Pipes extensively used in Brooklyn, and now introduced in New York, Jersey City, Newark, Hartford, Albany, and other localities, from 8 to 24 inches in calibre.
Water Pipes, lined and coated with Cement mortar, ready for laying and back filling, and can be tapped like cast-iron pipes, which they excel in durability, discharge, and economy.
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R. A. BRICK, Manufacturer of CAST IRON WATER and GAS-PIPES. RETORTS, PIPES, &c., always on hand. Office, 109 Leonard Street, New York.

S. FULTON & CO., (Successors to Colwell & Co.) Manufacturers of Pig Iron and Cast Iron Gas and Water Pipes, also Heavy and Light Castings of every description, No. 207 North Water street and 206 North Wharves, Philadelphia.
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GAS APPARATUS
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UNION GAS METER WORKS.

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PATENT WATER-METER.
This Meter combines
ACCURACY, SIMPLICITY, and
REMARKABLE DURABILITY,
with such ease and certainty of motion, as to offer no appreciable obstructions to the flow of water in the pipes to which it is connected, as it runs and registers upon three inches head, or when delivering the smallest stream. These qualities, with its low cost, have caused its extensive adoption by corporations and individuals, in many of our largest cities.
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Gratis and post free, "The Inventor's Manual," also a pamphlet, "L'Obtention de Patentes Anglaises," 500 Mechanical Movements; the first part of Kinematics, or the Transformation of Motion, by Joseph Willcock, C. E., Mem. Soc. of Eng. May be had at the above address, and of any bookseller. Price 2s. 6d.
The second part is approaching completion and will shortly be announced.

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And expert in Patent Cases, 335 BROADWAY (Moffat's Building.) New York.

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For Lighting and Heating Purposes.
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Regulated to burn without noise or fluttering at sixth-tenths to eighteen-tenths pressure. Last twenty Scotch tips. Price from 8s. to 40s. per gross; liberal allowance to wholesale buyers. Any size for any gas (coal, wood, or cannel) screw either taper ⅜8, ¼4, or plug.

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And Contractor for Coal or Oil Gas-Works.
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To Manufacturers of Petroleum Gas.
For sale, Parrish's Patent Gas and Air Mixer, adapted to all works using Petroleum or other oils, by which rich Petroleum Gas is mixed, after it leaves the holder, with a proper proportion of air, giving it the greatest illuminating power, without smoke, through any burners. The apparatus being attached to the outlet pipe, requires no alteration of the works.
Apply at the Gas-Works of St. Nicholas Hotel, No. 63 Mercer st., N. Y., where one can be seen in operation; or address D. Parrish, Jr., St. Nicholas Hotel, New York city, or No. 1416 Arch street, Philadelphia.

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Special attention given to the Buying and Selling of Gas-Light Companies' Stocks.

500 Tons Cast-Iron Water-Pipes Wanted.
OFFICE OF THE BOARD OF PUBLIC WORKS, CHICAGO, Ill., May 25th, 1864.
SEALED PROPOSALS WILL BE received at this office until 11 o'clock, A. M., Saturday, June 4th, for FIVE HUNDRED TONS of 4, 6, and 8 INCH WATER-PIPES, to be delivered at the dock of the Board, in Chicago, on or before October 1st next, according to specification on file in this office, copies of which will be furnished, if desired.
The pipes may be in lengths of 9 feet or 12 feet, but the length of 12 feet will be preferred. For 9-feet pipes the weight will be, respectively, for 4, 6, and 8-inch pipes, 220 lbs., 330 lbs., and 450 lbs., and for 12-feet pipes in proportion.
Bids must be directed to the Board of Public Works, endorsed "Proposal for Water-pipes."
The Board reserves the right to reject any or all bids.
J. G. GINDELE, FRED. LETZ, O. J. ROSE, } Board of Public Works.

THE AUBIN
GAS-WORKS COMPANY,
Of Albany, N. Y.,
Now contract their works to make 10,000 feet of good Gas from 2,000 pounds of *hard* wood and 40 gallons of kerosene tar, *before payment can be demanded;* and the charcoal is worth the cost of the wood.
Many Village Gas Companies can be referred to.

"HER MAJESTY"
CHAMPAGNE.
THE ROYAL WINE OF ENGLAND.
A limited quantity of this delicious and superior Wine has been secured for the undersigned, and the first shipment of 500 cases has arrived this day, by the steamship "Olympus," from Havre.
It comes direct from the cellars of the well-known house of Messrs. DE VENOGE & CO., at Epernay, France, and the present invoice will be introduced into this market at the very low price of
Twenty Dollars per Case of Quarts.
Payable in currency, which is much below its actual first cost.
The superior quality of this Wine is guaranteed, and it is offered with every confidence of its entire approval by connoisseurs, and lovers of a fruity, full-body wine.
Orders for one or more cases may be addressed, by letter or otherwise, to the undersigned,
WM. HENRY WARD,
WINE AND FRUIT DEALER,
Quarts, $20. No. 7 Broad st., near Wall,
Pints, $22. New York.

THE GAS-POWER ENGINE,
MOTEUR LENOIR.

Messrs. BARRETT, EXALL & ANDREWS

Having made arrangements with the proprietors of the above valuable Patent, on terms which must command its introduction into Great Britain and her colonial dependencies, are desirous of at once arranging for the formation of a Company under the Limited Liability Act.

Believing that the value of the Patent to Gas Companies cannot be over estimated, and that it is destined to occupy a sphere in powers which, though enormously extensive, have never yet been worked; and believing also that the Gas Companies should have the first opportunity of possessing it, Messrs. B. E. and A. will be happy to receive any communications with a view to that result before they introduce it to the public.

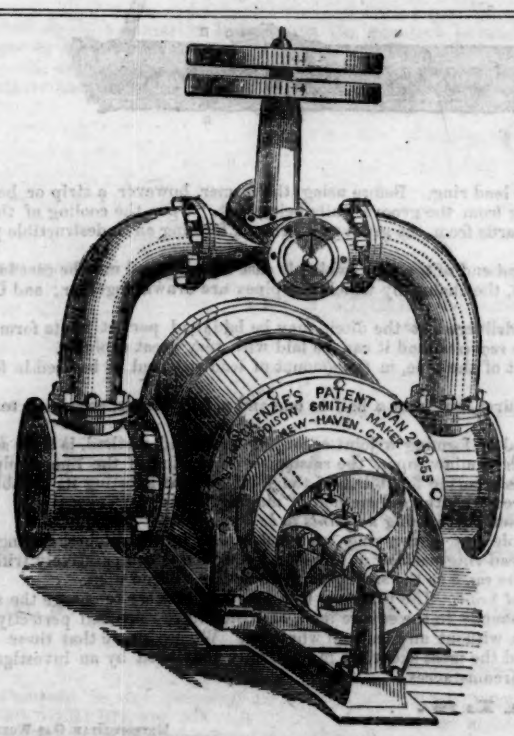
The manufacture will be at once commenced with the 3, 2, 1, and ½ horse powers. They are in form like a horizontal steam engine; require no boiler, chimney, or expensive setting; are elegant in appearance, perfectly clean, free from smell, and can be set to work at a minute's notice—the cost ceasing when they are at rest.

THEY ARE ABSOLUTELY FREE FROM DANGER,

either from explosion or fire, and require the minimum of attention.

Address as above, at

Kate's Grove Iron Works, Reading, England.



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Sole Proprietors and Manufacturers of

THE MACKENZIE PATENT GAS EXHAUSTER

AND

PATENT COMPENSATOR.

They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts, either clay or iron. The Compensator obviates entirely the necessity of water-joints, is compact, durable, cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

We are also sole proprietors and manufacturers of the

MACKENZIE PATENT BLOWER, PATENT CUPOLA AND SMELTING FURNACE.

The Blower is a Force Blast machine, durably built, and can be driven with one-third the power required to drive the ordinary Fan. The Cupolas are manufactured in sizes to melt from 1 ton to 20 tons per hour, will save one quarter of the time required by the old style Cupola, and 33 per cent. nel. Address SMITH & SAYRE, 458 Broadway, New York.

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Continue, as heretofore, at their old Establishment,

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WET AND DRY GAS METERS (Consumers'),
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GLAZED METERS, METER PROVERS, AND PHOTOMETERS,
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FLUID AND PRESSURE GUAGES,
PRESSURE REGISTERS AND INDICATORS, &c., &c., &c.

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DRAKE'S
PATENT
AUTOMATIC GAS MACHINE.

THIS MACHINE, which has been in constant use for more than two years, is now acknowledged to be the

Most Convenient,
Simple, and
Efficient Method

OF LIGHTING BUILDINGS OF ALL KINDS, out of the reach of regular gas-works, ever brought to public notice.

The SIMPLICITY OF THE APPARATUS, its ENTIRE FREEDOM FROM DANGER, the LITTLE ATTENTION REQUIRED, the EASE WITH WHICH IT IS MANAGED, and THE CHEAPNESS and SUPERIORITY OF THE LIGHT, has gained for it the favorable opinion of those acquainted with its merits.

The Machine takes up but little room; no disagreeable odor is experienced in its use; no fire is applied to the apparatus at all; it can be attached to ordinary gas-pipes used for coal-gas, and is burned through the same kind of fixtures.

These Machines are manufactured in Boston, by the AUTOMATIC GAS-MACHINE CO., and are for sale at their Store, 78 Washington street, Boston, and also at the Agency, MITCHELL, VANCE & CO.'s, No. 620 Broadway, New York.

For further particulars, address—

MITCHELL, VANCE & CO.,
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PRINCE'S METALLIC PAINT,

AN INDESTRUCTIBLE COATING FOR

IRON, TIN, and WOOD.

It consists of seventy-two parts Oxide of Iron, and twenty-eight parts Cement Lime Stone in the one hundred pounds.

It has much more body than red or white lead. It is warranted perfectly water and fire-proof and to withstand a greater heat on metals, without scaling, than any other paint in use.

It is a perfect cover for all kinds of iron, tin, or wood-work, out-houses, and canvas coverings. It prevents and arrests the corrosion of metals, and is not affected by the action of salt, gases, acids or ammonia.

It hardens under water, as has been fully demonstrated by its application to gas-holders, by many of the largest gas companies in the United States; which companies having thoroughly tested its properties as herein claimed, pronounce in its favor over any other paints in the market, even though sold at double its price.

As a coating for patterns of iron or wood, when mixed with shellac, it is much superior to beeswax, oil, or shellac alone, as has been proven at the large founderies in the country.

For patching boilers and making joints, it is considered superior to red lead, or any other preparation.

For cleaning metals it takes the place of crocus, rouge, and emery, being better and cheaper.

This Paint requires no more oil than dry lead or zinc, and much less than the ordinary mineral paints. It is free from any waste, and possesses a spreading and covering power unequaled.

Terms, by the Barrel or Half Barrel, Four Cents per Pound.

A liberal discount made to parties purchasing by the ton.

A Barrel or Ton will be forwarded to any gas companies desirous of testing its qualities, for which there will be no charge if it does not give entire satisfaction as being the cheapest and most durable of all other Paints in the market.

Also, Prince's Imperial Black Paint, and Prince's Protoxide of Iron.

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Manufacturer of all kinds of FIRE-BRICK, GAS-HOUSE TILES, to suit all the different plans in use. Clay Retorts and Dentists' Muffles. Orders filled at short notice.

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NEWSPAPER WRAPPERS. Mara's Patent Self-Sealing and Folding Water-lined Newspaper Wrappers.

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JOHN Q. PREBLE,
Envelope Manufacturer,
No. 77 White st., near Broadway, N. Y.

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ROBBINS' PATENT GAS AND WATER JOINT.

The Proprietors of this unrivalled joint are now prepared to introduce it to general use, and to guarantee that, in all respects, it will fulfil perfectly all the requirements of either water, gas, or steam. It is a joint which remains in all situations absolutely tight.

The following illustrations, with the appended explanations, will give a good idea of the improvement:

Fig. 3.

Fig. 1.

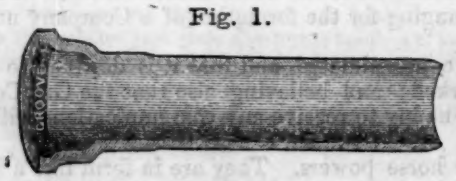


Fig. 2.

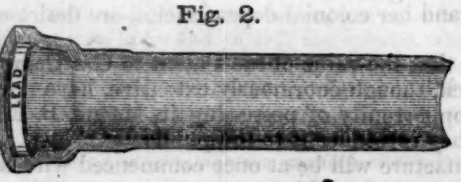


Fig. 4.

Fig. 1. Is a sectional view of a pipe showing a groove to receive a lead ring.

Fig. 2. Is a sectional view of a pipe showing a lead ring in the groove.

Fig. 3. Represents a former, which is used in the bell end of the pipe while casting the lead ring. Before using the former, however, a strip or belt of India rubber is first inserted in the socket, against which the former rests to prevent the lead escaping from the groove while being cast. Upon the cooling of the lead, the former and rubber ring are withdrawn from the socket, and the lead ring is left projecting inwards from the groove all around, forming an indestructible packing to receive the spigot-end of the pipe.

Fig. 4. Shows two pieces of pipe in connection with an hydraulic jack, by which the spigot-end of the pipe (which is cast tapering and may be cast in a chill), is forced into the lead ring in the groove which perfects the joint. A, represents the jack; B, B, the chains by which the pipes are drawn together; and C, C, pieces of pipe.

This ring joint packing may be cast at the foundry or any convenient place, and when delivered at the ditch, may be laid, and perfect joints formed, by any laborer, above or below the surface, or in ditches filled with water, there being *no joint ditching required*, and it can be laid with very great rapidity.

Among the economies realized by this joint may be enumerated, the saving in the weight of the pipe, in the amount of lead required to be used in forming the packing, in the labor of ditching, and in laying the pipe.

The bell or socket may be cast one-half the usual length, as the width of the groove requires, but from a half to one and a half inches, according to the size of the pipe, thus saving in the total weight about two hundred pounds per ton.

The weight of lead required to form this joint, as compared with the amount of lead used in forming a joint according to the old method, is fully seventy-five per cent. less, only so much being required as to maintain the compensating principle, or enough to allow (upon the raising or depressing of the line of pipe out of a direct line) what is lost upon one side of the ring packing, to take its place upon the other; thus securing flexibility of the joint without affecting its reliability. The use of yarn or hemp packing is dispensed with, the cost of which is an entire saving as compared with the old method of making joints.

The saving of labor in ditching is the total amount usually expended in digging joint-holes, there being *no joints to be caulked.*

The saving in labor in laying pipe furnished with this joint is a sum equal to the whole cost of carrying lead, fuel, ladles to the ditches, casting the lead, bailing out water, and the entire labor of caulking, less only the sum charged for casting the lead ring packing at the foundry, which is comparatively trifling. This last-mentioned economy has been estimated by the best engineers at seventy-five per cent., or the same as the saving in the quantity of lead used.

The cost of pipe cast from our patterns is the same per ton as pipe cast for the old form of joint. The principal iron-founders propose to charge the same price.

We have submitted these joints in water-pipes to a pressure of two hundred and fifty pounds to the square inch, and they have remained perfectly tight. It has also been submitted for months in gas-pipes to the ordinary pressure of our city gas-mains, without any leakage whatever. We are aware that these statements may be deemed by many extravagant, but the merits of the improvement warrant them all, and the most skeptical may be fully convinced by an investigation of its value, and by witnessing the tests to which we submit it, or by its use under any conceivable circumstances.

TESTIMONIALS.

Office of the Water Commissioners,
City Hall, Jersey City, October 14th, 1863.

Dear Sir,—On the 26th of May last, about two hundred and sixty feet of cast-iron water-pipes, six inches in diameter, with joints constructed according to your invention, were laid for the Jersey City Water-Works, in Prospect street.

The operation of uniting the joints of the pipes, was performed with remarkable facility, and with an important saving in time, materials, and labor. The joints proved perfectly water-tight, after turning the full head of water on the pipes.

In my opinion, your invention has proved entirely successful, and will be found highly beneficial to water companies.

Yours, respectfully,
ROBT. C. BACOT,
Superintendent and Engineer, Jersey City Water-Works.

Mr. R. C. Robbins.

Engineer's Office, Croton Aqueduct Department.

Dear Sir,—I have examined your plan for making joints in cast-iron water pipes, and have a report from one of my assistants, of certain experiments made by you, to prove the certainty and economy with which the joints can be made, and their stability when finished.

I think the experiments showed that the joints could be made quite as rapidly, if not more rapidly, than those made in the ordinary method now in use; the quantity of lead used was less than that required in the common joint, and no yarn packing was required. In these respects, your joint seems superior.

After the joints were made, a pressure of three hundred pounds to the square inch, was put upon the pipe in such a manner as to test the efficiency of the joint to prevent both leakage of water, and separation of the pipes from each other longitudinally. This pressure failed to produce either leakage at the joint, or separation, so long as the pipes lay in a direct line; but on deflecting them six and a half inches, in a length of twelve feet, the joint commenced leaking. It is fair to add, that this is a greater deflection than would often be found necessary in laying pipe.

I think the efficiency of the joint in both the points tested in this last experiment, might be increased by increasing the quantity of lead, both in thickness and width.

Altogether, the result of the experiments was such that I have determined to make a more thorough test of your invention by putting down about one thousand feet of pipe, when we commence our operations for the coming season.

The diameter of the pipe subjected to experiment, was six inches, and is the same size that I propose to put down next year.

I am, very respectfully, your obedient servant,
A. W. CRAVEN, Chief Engineer, &c.

To R. C. Robbins, Esq., Jersey City.

Metropolitan Gas-Works,
Engineer's Office, New York, October 9th, 1863.

Dear Sir,—The undersigned had the pleasure of being present at an experimental test of your patent joint for gas and water pipe, made at the yard of the Croton Aqueduct Department, and cheerfully testify to the results obtained, namely:

First experiment was made with two lengths of eight-inch pipe, jointed together, when a pressure of three hundred pounds to the square inch was applied. This pressure did not force the pipe apart, nor start the joints, but they remained, during this experiment, perfectly tight.

Second experiment was made by deflecting the pipe five inches, which is about equal to eighteen inches in one hundred feet, and the same pressure applied, which caused a small leak at the joints.

Third experiment was made by taking the pipes apart and rejointing them, when the same pressure was applied when lying straight and when deflected; at this experiment there was no leakage.

From these severe tests it is my impression that the superiority of your patent joint has been made manifest, and that it must eventually supersede the old way of jointing pipes together, saving both time and material.

Wishing you success in your enterprise,

I am, very respectfully, yours, &c.,
AMBROSE J. WHITE, Engineer.

To R. C. Robbins, Esq.

Office of the Metropolitan Gas-Light Company,
New York, October 9th, 1863.

Dear Sir,—Having been present at the testing of your patent joint for gas and water pipe, at the yard of the Croton Aqueduct Department, I can testify to the results as stated by Col. A. J. White and fully concur with him in the opinion expressed in his letter to you of this date.

Very respectfully, yours,
W. Titus, Secretary.

R. C. Robbins, Esq.

New York, October 23d, 1863.

Gentlemen,—I am pleased to be able to inform you, that we are fully satisfied that we have done well in adopting your "Improved Joint," in the construction of an aqueduct which we are now building on Oil Creek, Northwestern Pennsylvania.

We have ten miles of three and four inch pipe to lay this season, and, in our estimation, the perfection of the joint, economy in lead, and rapidity with which the pipe can be laid, render it entirely preferable to any other method of laying pipe.

Our Mr. Hutchings advises us that he is putting down the three and four inch pipe at the rate of twenty-five to thirty lengths per hour, with two men in the trench. We are much pleased with this result.

Respectfully yours,
Hutchings & Foster.

Messrs. R. C. Robbins & Co.

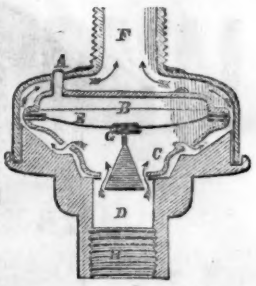
For further information, or for prices and terms, which will be very reasonable, apply to

R. C. ROBBINS & CO.,
No. 218 FULTON STREET, NEW YORK.

THOMPSON'S

PATENT

AUTOMATIC GAS CONTROLLER.



Notice to Gas Companies and Consumers of Gas generally.

WE RESPECTFULLY INVITE YOUR ATTENTION TO THE FOLLOWING TRUTHFUL DESCRIPTION OF THE construction and operation of this recent and most important invention; its application to every street lamp, and on the fixtures within the works of the Gas Companies, as well as for the use of the general consumer, will be found to effect perfectly and reliably, the object so long sought for, viz.: **a perfect control of the Gas under varying pressures, emitting the Gas at the burner without force, and without increase or diminution of quantity, and hence promoting the highest possible illuminating power of the Gas.**

THE AUTOMATIC GAS CONTROLLER

Is designed to occupy the place of the gas-burner. Within the circumference of a small cylinder, below the burner, is placed a conical valve, attached to a movable diaphragm, the valve and valve seat is proportioned, so that under a supply of Gas, varying in pressure from four-tenths to five inches, the burner will continue to produce the same consumption and development. The unerring accuracy of movement of the Diaphragm at every change of pressure, whether gradual or sudden, and its positive control of the valve which admits, by its proportionate increased or diminished aperture, the same unvarying amount of Gas, has elicited the unqualified approbation of engineers and other experts in the profession.

The simplicity of its construction, and materials used, are a sure guarantee of its durability and continued successful operation. They afford to the consumer of Gas the advantage of a **superior light, with the greatest possible economy**; and for the Gas Company, they control the Street Lamps, affording a more satisfactory light for the public, without waste.

The public are invited to witness its operation, at the Office of the Company; and samples will be sent to Gas Companies for experiment, on application by letter or otherwise.

G. W. THOMPSON & CO.,

Office, 52 GREENE ST., (up stairs.)

A. L. BOGART, Agent, 592 Broadway,

New York.

We are permitted to refer to the following Gentlemen, who have thoroughly examined our Gas Controller:

GEO. H. KITCHEN, Inspector of Gas Meters, 561 Broadway.
CHAS. ROOME, President Manhattan Gas Company.
J. H. ADAM, President New York Gas Company.
PETER COOPER, Cooper Institute.
JOHN A. DUFF, Olympic Theatre.

THE AMERICAN METER CO.,

Organized under the General Manufacturing Laws of the State of New York.

SAMUEL DOWN, President. HENRY CARTWRIGHT, Vice President. RICHARD MERRIFIELD, Secretary and Treasurer.

Trustees.

SAMUEL DOWN, WILLIAM HOPPER, R. H. GRATZ, HENRY CARTWRIGHT, RICHARD MERRIFIELD.
THOMAS C. HOPPER, *Superintendent at Philadelphia.*

This Company is now prepared to furnish WET AND DRY GAS METERS, STATION METERS, GOVERNORS, PRESSURE INDICATORS and REGISTERS, SERVICE and METER COCKS, and all other articles in their line appertaining to the use of Gas-Works.

The combination of Mechanical and Scientific Skill, and the long experience of the several members of the Company, is a sure guarantee of durability, accuracy, and excellence of workmanship. Orders addressed

AMERICAN METER COMPANY,

340 WEST TWENTY-SECOND STREET, NEW YORK,
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1 BARRETT STREET, BOSTON, will meet with prompt attention.

STEAM-PUMPS.

WORTHINGTON'S Steam Pumps, extensively used by Gas-Light Companies. For Sale at greatly Reduced Prices.

Also, a new and highly successful Pump, driven by water pressure, requiring no attention or repairs, and the most economical water motor yet constructed.

Patent GATES, for Water and Steam-stops.

HENRY R. WORTHINGTON,
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WEST'S IMPROVED PUMPS, the most Simple, Durable, and Powerful, and the Cheapest in use.

J. D. WEST & CO.,
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GEO. H. KITCHEN & CO.,
NEW PATENT
GAS APPARATUS
For Country Residences, Public Buildings, &c.,
FROM $300 UPWARDS.
EVERY DESCRIPTION OF GAS FIXTURES.
Gas Fitting in all its branches.
561 Broadway,
NEW YORK.

TO GAS COMPANIES.

THE UNDERSIGNED DESIRES TO undertake the supervision of several small Gas-works, to visit and examine them as often as may be necessary; to obtain and inspect their coal, castings, fire-brick, and other materials; and to manage their general business in such a manner that they shall be under such supervision as is now attainable in large works, at much increased cost. Also, to advise as general Consulting Engineer and expert in practical chemistry.

CHAS. M. CRESSON,
Late Asst. Engineer of the Philadelphia Gas-works,
417 Walnut st., Philadelphia.

ANALYTICAL CHEMIST
C. ELTON BUCK,
Analytical and Consulting CHEMIST,
39 NASSAU STREET, NEW YORK,
Analyses of Ores, Minerals, Soils, Guanos, Coals, &c., and Tests of Commercial Articles, carefully and promptly made. Consultations may be had, and opinions given on Chemical questions. Samples for analysis from a distance, may be sent by mail or express, directed to the Laboratory as above.

GLYCERIN
FOR
Filling Wet Gas-Meters,
Cheaper than Whisky or any other substance.

We have furnished the Cincinnati Gas and Coke Company 300 barrels Glycerin, for filling their wet meters, and are now ready to supply other Gas Companies at the lowest cash prices.

We warrant our Glycerin not to corrode the meter metal, nor to freeze at the lowest ordinary temperature, nor to evaporate.

HARTMAN & LAIST,
Manufacturing Chemists,
Cincinnati, O.
Office 64 Sycamore.

NEW YORK FIRE-BRICK and Clay Retort Works. (Branch Works at Kreischerville, Staten Island.)

B. KREISCHER, office 56 Goerck street, corner Delancy street, New York.

Gas Retorts, Tiles and Fire-Brick of all shapes and sizes. Fire Mortar, Clay, and Sand. Articles of every description made to order at the shortest notice. B. KREISCHER.

WOODEN PURIFYING TRAYS.

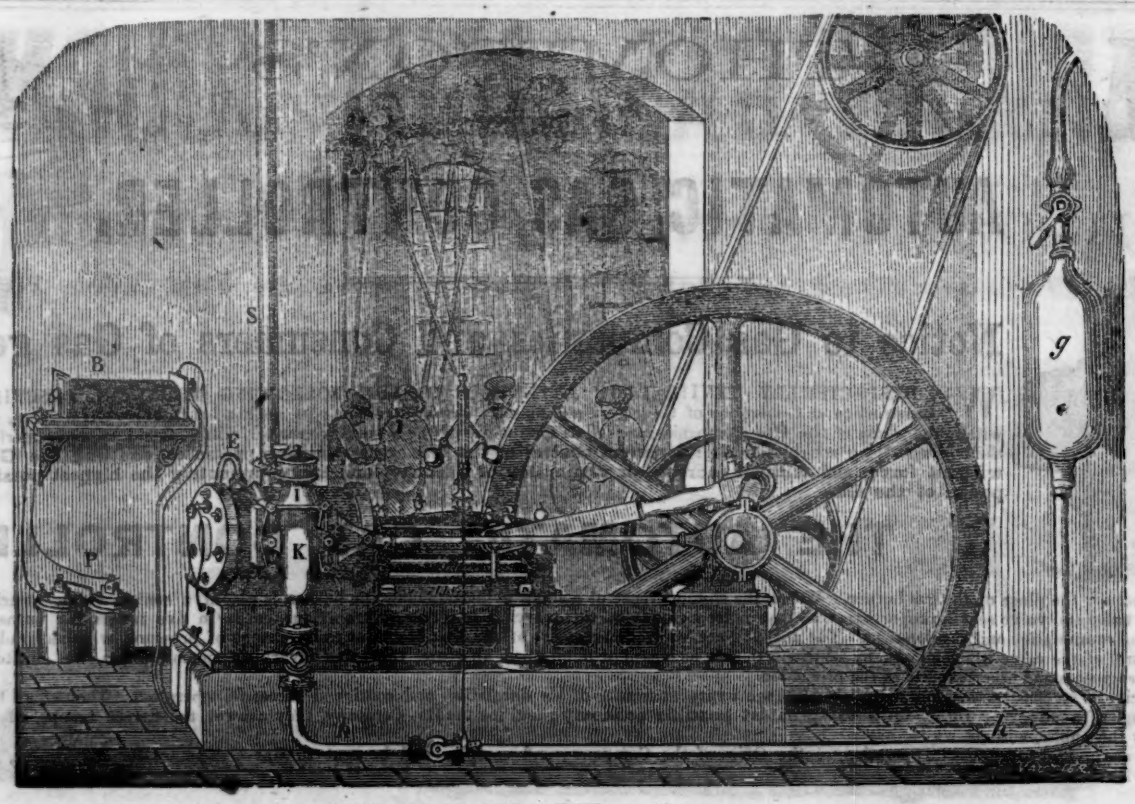
PATENT
Conically Slotted Solid Wood Sieves
FOR GAS PURIFIERS.
CAUTION
TO
GAS MANUFACTURERS.

The Conically Slotted Solid Wood Tray was patented 21st October, 1862, by N. O. Hawxhurst, assignee of Wm. Combe, and all persons are cautioned against purchasing such trays of R. G. Hunt, or any other person except the subscriber, as it is a direct infringment of said patent. The following companies are now using these trays.

Manhattan, New York,
Williamsburgh,
Brooklyn,
Albany,
Baltimore,
Philadelphia,
Chicago,
Louisville,
And numerous others.

Orders received by mail or otherwise.

JOHN L. CHEESMAN,
147 Ave. C, New York City.



MOTEUR—LENOIR.

LENOIR GAS ENGINE.

This is a horizontal engine, in which a piston, by a connecting rod drives a horizontal shaft.

The gas enters by the pipe "h" from the regulating reservoir "g," (made of vulcanized india-rubber,) which regulates the feeding and the branches connected with the gas-pipe.

A tube, K, receives the gas conveyed by the pipe "h," and conducts it to the valve, which opens and closes alternately, by means of a rod moved by an eccentric wheel fastened to the end of the shaft.

Two of Bunsen's piles, P, sufficient to produce the electricity are placed at a little distance from, and in communication with a Ruhmkorff electric apparatus, B. The electric current of this apparatus is conducted by means of insulated wires to the electricity distributor "m," placed on the front of the frame, while the current of electricity and its arrival at the inflammator, inserted at each end of the cylinder, is directed by the movement of the piston-rod, which, by an ingenious combination, impels a small movable slide before the distributor.

The burnt gas, after having performed its functions in the machine, escapes, by means of a valve, through a pipe, S, and the water designed to cool the interior of the cylinder enters by a double passage, by means of a pipe situated near the escape-valve, and goes out by the pipe, E.

A two and a half horse Engine has arrived from Paris and is now being erected and put in practical operation, when due notice will be given to the public. The lateness of its arrival precludes further notice of it in this advertisement than to say to those who are unacquainted with the principle, that the

LENOIR GAS ENGINE

Requires no Fire and makes no Smoke,

No Noise, no Dirt, and cannot Explode.

See full description in this number on page 344.

It is propelled by the expansion of Air, dilated by the explosion of Gas, which is ignited by the

ELECTRIC SPARK.

In the meantime, enquiries may be addressed to the

Editor of the American Gas-Light Journal,

NEW YORK.